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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, NOVEMBER, 1896. No. 1.

The New Motor Law in England.

THE most important event of the past month was the going into effect in England, on Nov. 14, of the new Act of Parliament legalizing the use of motor vehicles on the common roads of that country. The special regulations under which the new vehicle is to be introduced were referred by Parliament to the Local Government Board, a body which has superior facilities for examining into the details of a public question of this kind. The result of the Board's deliberations, made known immediately upon the act going into effect, is reprinted on another page of this issue.

The sum and substance of these provisions may be reduced roughly to the general axiom that the vehicle must be at all times under the control of its operator, and that the speed at which it may be allowed to travel depends upon its weight and the conditions of the road. As this general axiom is now thoroughly understood by drivers of horses, little educational work will be necessary in making the change from horse vehicles to motor vehicles. The minor specifications of the rules, such as the number and efficiency of brakes, lamps, consideration for others using the highway, etc., etc., are only such as common sense would dictate and custom fortunately has long since made second nature to us. The key to the temper of the Board's work can be taken from the following clause: "He shall not drive the light locomotive at any speed greater than is reasonable." Thus is the entire matter referred to the good sense of the promotors of the new industry, to whose interest it manifestly is, though habit were forgot, to avoid antagonizing the conservative forces that oppose the innovation.

But London *Engineering* does not take this view of the situation. Its peace is disturbed by visions of slaughtered pedestrians and shattered vehicles, because of the latitude the Board has given as regards the speed at which a motor vehicle may be driven. In its imagination the new vehicle grows into a veritable juggernaut, sweeping through the streets at top speed, regardless of the conditions of the highway and the rights of other users thereof.

A heavy vehicle weighing several tons, says *Engineering*, would not be likely to do any harm at 7 miles an hour, but at 14 miles an hour it would become a fearful menace to life and limb. This is undoubtedly true, but it is pertinent to ask the question, who, with the exception of the editor of *Engineering*, imagines that anybody will be guilty of such madness as to run a heavy vehicle at such speed? Is it reasonable to assume that citizens, sober and sensible to-day, will become idiots or maniacs to-morrow merely because they manage motors instead of horses?

Continuing the editor says: "The first machines will not be bought by persons of mechanical training, but rather by amateurs and enthusiasts who have not learned by experience that it is foolish to try experiments at one's own expense."

The inference from this language is that only persons of "mechanical training" know the laws of the road, and only they are to be entrusted with the guidance of a motor vehicle. But how is it with horse vehicles? Are all careful drivers persons of "mechanical training"? In fact, is it not true that few careful drivers are persons of "mechanical training"? And if thousands of persons who are now most careful and considerate users of the common roads have no "mechanical training," how is it necessary that they should have "mechanical training" to drive a motor vehicle as carefully? A man must become familiar with the management

of any machine in order to handle it successfully on the road, but this applies as well to a horse as to a motor. The editor of *Engineering* would not send a small boy out to drive a team through London or New York streets, nor would he entrust a motor vehicle in such inexperienced hands, even though the motor were as common as the horse is now. Why then does he fill his mind with cruel fancies? Experience on the road is necessary in either case, and the liberties taken must depend largely upon the skill of the driver in any event, but it is no more necessary for a man to be a mechanic in order to guide a motor vehicle carefully than it is for him to be a horse doctor in order to drive a horse carefully.

It was the well-nigh unanimous opinion of students and promotors of the motor vehicle that existing regulations in regard to reckless driving were ample to cover any violations of the common rights of the road that motor users might commit, and that any attempt on the part of the authorities to fix a low limit of speed would hamper the growth of the industry. The Local Government Board has wisely concurred in this opinion by fixing the maximum speed at 12 miles an hour, which is ample for the present, and has left the motor vehicle practically unfettered in its development.

THE annual Horse Show at Madison Square Garden, New York, was highly successful from the society point of view. The Four Hundred and their satellites were all there in their finest toggery. From the commercial standpoint, however, it was not re-assuring to the horse trade. The prices obtained for good carriage horses at the sale which followed the show were ridiculously low.

JAMES MEANS, editor of the *Aeronautical Annual*, has just published a pamphlet entitled "Twentieth Century Energy," in which he calls attention to the wonderful development now going on in gas engines, and in the utilization of gas for power purposes. He predicts that gas will be to the twentieth century what steam has been to the nineteenth.

THIS from an English contemporary:

"They must build motor cars badly in the States; and in a race between horseless carriages recently organized in New York, and run off on the country roads in the district, out of 28 machines which had been entered, only six started, and these could not mount the hills."

THE record of the Duryea wagon in the London-Brighton outing is a sufficient commentary on the above.

THE French correspondent of an English contemporary says that a motor carriage is certainly noisier than an ordinary carriage. As regards the ordinary carriage this may be admitted, but not as regards the ordinary *horse* and carriage. It is the horse that makes most of the noise, and so far as the grind or clang of iron tires on sand or pavement are concerned they are obviated by the use of rubber tire in the motor vehicle.

Volume I, No. 1.

PARTIES having copies of the November, 1895, number of THE HORSELESS AGE, which they are willing to sell or exchange for later numbers, are requested to communicate with the publisher.

The Development of the Motor.

BY JAMES MEANS.

It seems to me that the improvement of the motor vehicle, rapid as it is, would be hastened if, in prize contests, the motor, apart from the vehicle, received more attention than it does.

The various road trials show that while some inventors excel in their motors, others excel in their vehicles. In the word "vehicle" I mean to include all through this article not only the carriage or wagon, but also all the mechanical arrangements excepting the motor. In alluding to the whole affair the compound word "motor-vehicle" will be used.

Other things being equal the best motor-vehicle is that which has the best motor; but then, other things seldom, if ever, are equal, and road contests give only a partial test of motors.

For example, supposing that two motor-vehicles race three times from Paris to Marseilles, supposing the two competing vehicles are alike as to weight of motor, weight of vehicle, number and weight of passengers, and that the operators are both skilful and equally so; supposing also that the races are all very close when the finish line is reached and that there have been no detentions; what has been demonstrated in regard to the relative merits of the motor-vehicles? That, on the whole, they are very nearly equal to each other in excellence? One is inclined to say yes, yet it is quite conceivable that one of the motor-vehicles may have been designed by a man ever watchful in the avoidance of possibilities of derangement and breakage, while the other may have had weak parts and easily deranged mechanisms which remained concealed even through the three races.

In the races what has been demonstrated concerning the relative merits of the motors? Before answering this question the excellencies we should like to find in motors must be enumerated. In naming these I shall not try to do so exactly in the order of their importance, because that would open up too large a subject for the limits of this article. The ideal motor will excel in safety, efficiency, manageability, simplicity, steadiness under varying loads, durability, economy of fuel, economy of manufacture, and it will be just as light in weight per horse-power as is compatible with durability and economy of manufacture. We cannot expect to acquire an ideal motor, but it may help us if we constantly keep in mind just what kind of a motor it is that we want.

From these races we learn in regard to the motors that probably they are both safe in skilled hands; as to relative manageability we learn nothing positive, for, under the assumed conditions, one of the skilled operators may have held his own by the exercise of all of his skill, while the other operator may have had but slight calls upon his; as to simplicity the races showed nothing, for, under the assumed conditions, one motor may have been extremely complex, and the other simple; as to durability it was shown in both motors to be sufficient for the three runs; as to relative steadiness under varying loads, nothing was indicated, for one operator by the exercise of all of his skill may have by that held his own against a motor with a greatly superior governing apparatus; as to economy of manufacture the races could not be expected to show anything; as to relative economy of fuel and power of motors, nothing definite was settled by the races because the relative amount of work done by each motor is unknown; that is, under the conditions there was nothing to show in either case, how much power was lost between the motor shaft and the ground or in the friction of the vehicle wheels. Some of the variable speed devices cause a greater loss of power than others. Now in the races we have been considering the assumed conditions were nearer to the ideal than any actual conditions which we have so far found in road contests, therefore the value of the tests already made on the road is less than that just given to the supposed tests.

From the foregoing the reader may be led to think that I have intended to disparage road tests, yet such is not the case. I am writing for the purpose of showing that *if we would see the rapid development of the motor-vehicle, we must have the prize contests of motor-vehicles on the road supplemented by prize contests of motors in the laboratory.*

It seems to me that the more road contests we have, the better; that in the long run the fittest motor-vehicle will survive but the results of road contests ought not to be taken for any more or less than they are worth. I am not criticising the decisions of any of the judges of recent road contests but rather am writing words of encouragement to the contestants who have been beaten.

So much for prize contests of motor-vehicles on the road; let us now consider the subject of prize contests of motors in the laboratory.

I advocate these because I am confident that the results will be valuable.

In the first place, we know that, as a rule, inventors are men of limited means, and find it difficult to get money to build their machines. I will venture to say that there are scores of inventors who will be able to spend money enough to build and send for exhibition single motors who are quite unable financially to build vehicles and bear the large expenses of road contests; moreover, after an inventor has made a good showing with a motor, his chances of getting financial aid to build and exhibit his motor vehicle will be decidedly improved.

If an inventor cannot show a motor which will give good results under exacting and thorough tests, it is a great pity for him to waste his money in building a vehicle.

I think it is now evident that the plan which I propose will bring more inventors to the front, and that surely is what we want to do.

Considering separately the motor, and the vehicle with its various mechanical arrangements, we cannot doubt that the former presents more difficulties than the latter. If we had had the suitable motor this problem of the practical horseless vehicle would have been solved long ago. In saying this I think I do not undervalue the ingenuity which is required and which has been shown in devising the vehicle and its manœuvring apparatus. But the the fact is that *the most serious difficulties demand the most serious attention*, and that is briefly why I think the motor itself ought to receive more attention than it does in prize contests.

I do not think that there will be great difficulty in raising a good sum of money for a prize to the exhibitor of the best small motor; the word *best*, of course, to be defined by a committee of experts.

The laboratory tests of each competing motor would show the power developed, and the quantity and cost of fuel per horse-power hour. The tests would also show the action of the motors under suddenly varying loads. Experts could form good judgment as to manageability, safety, simplicity, durability and cost of manufacture. If the experts were well chosen the best machine would win, and the interests of man-

ufacturers and users of horseless carriages would be advanced.

Those readers who may happen to know of my editorship of the *Aeronautical Annual*, and who may know that I especially want a motor for the purposes of aeronautical experiment, may think they discover in what I have written a case of special pleading. Perhaps I had better admit it. Yet I hope that my interest in aeronautics has not made me unsound upon the question of the horseless carriage. I am not now proposing prize contests of aeronautical motors, but simply of road vehicle motors.

This subject of efficient small motors is no narrow one; when the internal combustion engine is still further improved, its adaptability to multifarious uses is certain to make it a very important thing to the whole civilized world.

A Reader's Suggestion Pro Bono Publico.

A reader of THE HORSELESS AGE, who is too modest to wish his name mentioned, sends in the accompanying design of a gas engine, requesting that it be taken for what it is worth.

In the diagram A^1 A^2 are two cylinders of equal size. E is a cylinder of equal length, but smaller diameter. B is a piston-rod moving in a straight line in all three cylinders, carrying large piston-heads C C and a small head D.

F^1 F^2 are compression chambers.

H and I are pipes supplying explosive mixture to the cylinder E. Valves and other parts are omitted, as it is plain that such parts may be arranged in different ways.

The action of this suggested engine is expected to be as follows:

Supposing the cylinder E to be filled with an explosive mixture of air and gas or vapor, and the piston-rod and head to be moved toward K, then the contents of the cylinder E will be compressed into the chamber F^1, while the mixture will be drawn into the cylinder E from the pipes H I, on the other side of the piston-head D. The stroke then being reversed, the chamber F^2 will in turn be filled with compressed mixture. The mixture in the chamber F^1, by opening a valve (not represented), being then admitted to the cylinder A^1 and fired, the pistons will again be driven toward K, and at the same stroke a new supply of explosive mixture will be compressed in the chamber F^1. At the end of this stroke the parts are in position to explode the contents of the chamber F^2 and drive back the piston, thus keeping up alternate action, and giving an impulse at each stroke.

Or, by dividing the engine into two parts, each with its large cylinder for motive power and the small one for compressing, it could be coupled to the crank-shaft, so as to avoid the dead centre.

Those Motor Postal Wagons.

As previously reported in the THE HORSELESS AGE, the Post Office authorities have been investigating the motor wagon for some time with the intention of adopting a special motor postal wagon for the collection and sorting of mail in cities.

The drafting of the plans for the new wagon was placed in the hands of Mr. George S. Strong, the well-known mechanical engineer and locomotive designer of New York. They are now rapidly approaching completion, and a test of an experimental wagon will probably be made early in January.

Several New York dailies have reported that these wagons would actually be put into service this month, one of them naively adding that the "details of the motive power had not yet been decided upon."

The motive power which Mr. Strong is to employ is a gas engine of 25 horse-power, using compressed gas as a fuel, and the transmission device is on an entirely new principle, which will be fully described in due time.

The Bates Thermic Motor.

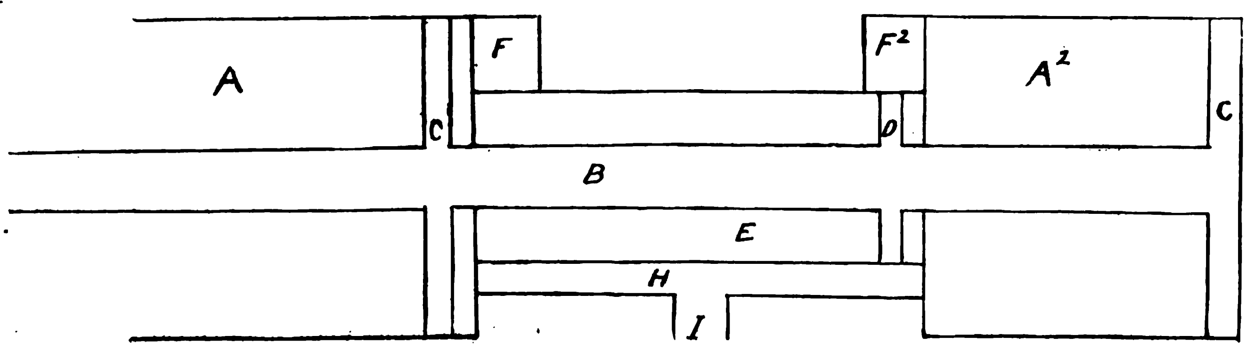
Hundreds of inventors have sought to produce power direct from coal without the use of the steam boiler. This fascinating problem has frequently been reported solved, but difficulties unforeseen always arose in practice, and proved once more that the inventor is generally too sanguine in his expectations.

The most recent claimant for these oft-disputed honors is the Bates Thermic Carbonaceous Motor, made by the Bates Thermic Engine Company, 652 Bourse, Philadelphia, Pa.

The base of the invention is said to have been furnished by a Frenchman named Gardie, who some years ago produced a motor on the same principle, though the name Gardie is now used only to designate the gas employed as fuel.

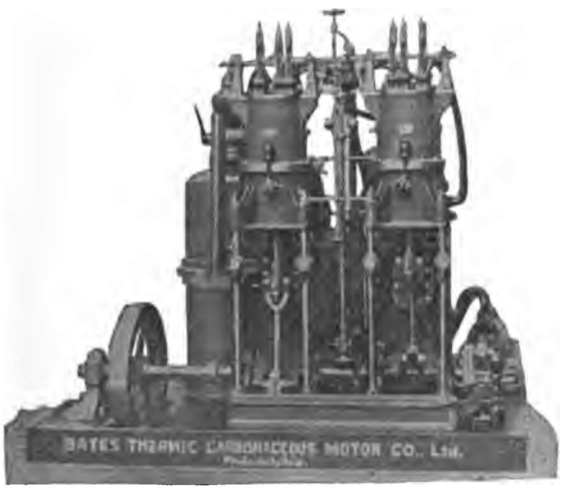
Gas and air are mixed to provide a fuel, but not as in the ordinary gas engine. The mixture is not exploded but the gas is burned in the cylinder, and the heat thus produced expands the air and drives the piston, which is single-acting.

The ignition of the gas occurs in the upper part of the cylinder, and between this and the piston proper there is said to be



a layer of air of lower temperature, which keeps the piston cool and renders lubrication easy.

The action of the motor is as follows: A charge of pea-size anthracite coal is placed in the top of the "gascogen," or gas producer. Compressed air is forced into this and is mixed with a small jet of steam, the mixture passing up through the incandescent fuel where it joins the products of the combustion and forms Gardie gas, which is said to be a fixed gas, free from the usual by-products such as ammonia, tar, etc. The gas passes to a dust arrester, which is equivalent to a steam separator, throwing down any minute coal dust which might be in the gas, much as a separator throws down the water from the steam. There are two single-acting vertical cylinders connected to the crank shaft at 180 degrees, and which has a third crank at the end for driving the air compressor, supplying the air to the gascogen and the cylinders. The gas now passes to a throttle valve, from which two pipes (one for gas, the other for air) lead to each cylinder, where they enter their respective valves, whose areas are so proportioned as to admit just the right quantity of each.



The piston has a plate of nickel which is first heated by electricity and is afterward kept hot by the burning gases. On the admission of gas into the cylinder it is ignited by the hot plate in piston and the mixture of air and gas, already under a pressure of 73.5 pounds per square inch, is expanded and then cut off the same as steam, giving a sharp cut-off. The exhaust goes to a regenerator, which is not unlike a surface condenser, containing small tubes which carry the compressed air to the cylinders, and gives up its heat to the air, it being claimed that nearly all the heat is thus expended in useful work. The upper part of the cylinder can be likened to a steam boiler, in which the burning of the gas inside the cylinder affords the heat, the water being in the jacket, which is divided into zones, so as to cause the water to circulate from top to bottom, or from cooler to hotter portions of the cylinder. This steam is used in the production of the gas in the gascogen. The motor is quite compact.

Among its disadvantages are the necessity for an auxiliary steam boiler in starting up after a long shut-down, an 8-hp boiler being needed for a 100-hp plant, also the necessity of electric heating of the nickel firing plates in the piston, although these are said to be necessary only after a shut-down of several hours. Another disadvantage is the excessive noise. A wonderful efficiency is claimed for it, however.

Charles F. Allen Gives Further Particulars.

Charles F. Allen, mechanical engineer, of Hueneme, Cal., whose design for a motor carriage appeared in a recent issue of THE HORSELESS AGE, has been so overwhelmed with correspondence as a result of it that he has been compelled to print a circular answering the many questions which are asked by his correspondents. In this he states that in his motor he obtains an impulse every one and one-half revolutions, and that the cylinders are kept cool by the admission of a volume of air before the final explosive mixture is admitted.

The method of admitting air to the cylinder and expelling it, for the purpose of cooling the cylinder, enables him to almost ignore the water-jacket, especially in cool weather, when the supply may be disconnected from the cooling tubes, which are also a portion of the supporting frame of the carriage and directed front, there to serve as a foot warmer.

"The horse-power developed by my motor will not be under 4½ horse-power at any time when going at one-half speed. The speed and horse-power of the engine can be increased or decreased, either independently or dependently, as desired. When working independently a graduated speed in either direction can be obtained from 0 to 20 miles per hour. When used in connection with the auxiliary speed attachment a graduated speed may be obtained from 0 to 40 miles per hour under favorable conditions. The engine is reversible and self-controlling in regard to valve gear. To start the motor from a dead stand-still, take your place in the carriage, give the operating lever a quick move up or down, as the case may be, then bring the lever back to that portion of the discs where no motion of the carriage is produced; the motor is then in motion ready to supply the necessary power when required. Thus a start is almost immediate. The motor is stopped either by turning off the gasolene or by placing it on the dead centre by the operating lever. With this motor any hill within reason can be climbed at nearly all times and at all seasons of the year. The dimensions of the motor are 16 inches by 12 inches by 8 inches. This does not include the valve gear, which takes up very little space."

Continuing he says:

"The governor and gasolene pump attachment is a very simple contrivance, with which we regulate the flow of gasolene. In this we utilize the resistance to the expansion force in the cylinder after about three-fourths of the stroke of the piston is made. The greater the load the greater the resistance, the greater the resistance the greater the amount of gasolene supplied to the cylinder, and *vice versa*. With this contrivance the engine can be regulated to run at a high or low speed and never need the slightest attention after once being adjusted.

"My 'eradicator' is cylindrical in shape, 12 inches high and 8 inches in circumference. To this the exhaust is admitted, and effectually muffled, the bad odor is eradicated and the force confined utilized in the form of a pulsometor to circulate the water through and around the water jacket and cooling pipes back to its starting place. Thus we have the eradification of sound, odor and heat, all in a nut-shell.

"Next in order is my auxiliary speed regulator, to which the motor is attached. It is of the friction type, very simple and compact, but different from any in use at the present time on motor carriages. This device is patented and used on special machinery at the present time. I have simply improved upon

it. The method attaching the power to the hind wheels is also new. I first fasten the wheels to two semi-axles, which revolve in ball-bearing boxes (the axle being cut in two near the centre). I place over where the half-axles join, the driving disc proper. This disc is so connected and attached to the two semi-axles that when going straight ahead it pulls on both wheels alike, bnt when rounding corners or turning around it gives way to the inside wheel and additional power is added to the outer wheel. This enables one to turn around in almost the length of the carriage, and does away with the injurious grinding and sliding caused by the solid axle system and the clatter of ratchets, where these are tolerated.

"There is scarcely any noise in connection with the working of the carriage, except a slight sound caused by the exhaust being released from the eradicator, which resembles the breathing of a person after exertion. Of course, the owner of such a carriage must see that it is kept in repair, that the bolts and nuts are kept tight, or else he must expect noise which he is directly responsible for.

"The driving disc is grooved, in order to get a greater friction surface in small space. Upon this disc is also operated a brake of the friction-band type. The band is provided with lugs, which fit into the grooves on the disc, forming a very effective brake, the addition of which can scarcely be noticed. The brake is operated either by foot or hand, the hand brake being used in case of emergency, and no brake-rods or levers are placed in sight other than the hand-lever shown in the drawing, which can be so attached as to work either right or left-handed. No noisy clogs, gearing, ratchets or sprockets are used, and every part will be made in duplicate and numbered, and be adjustable, so that in case of wear the lost motion can be taken up.

"The framework is of light T and angle steel, and cold-drawn tubing, all parts of which are reinforced where necessary. The frame, which contains the motor and machinery, is hinged around the roller-bearing boxes and supported by springs in such a manner as to relieve them from a great amount of the jar caused by rough roads.

"The motor is so constructed and attached to the carriage that the vibration is almost done away with, and no part of the working gear can be thrown out of line through jar or vibration. An opening is made in the top of the box. Through this opening the operator can inspect the motor and working gear when desired. The entire top of the box is also hinged to the back portion of the seat. When a thorough cleaning is required, or some general repair work is to be done, this entire lid is tilted up, bringing also with it the tail board, as it is also hinged to the cover, and folds down against the cover when tilted. When the lid has been placed in this upright position by unfastening the supporting framework of the machinery from the springs by means of two eccentric bolts, the entire mechanism is tilted over around the axle and out back, where free access can be had to all parts of the machinery without getting against the wheels.

"The wheels are made of best Ohio upland hickory, with ball-bearing boxes in front, while the hind wheels are fastened solid to the semi-axles. Solid rubber tires, with my patent reinforcements, are provided with every carriage.

"The steering is done by the motor, under the direction of the operator, by a simple pressure upon the operating lever in the direction desired to go. The harder the pressure the quicker the mechanism will respond. Immediately on relieving the pressure the lever returns to its natural position, the gear becomes locked and the front wheels remain in the position so placed until the lock is released and a change of direction is desired.

"The method of attaching the power to the front axle for the purpose of steering is by friction discs and pulley and small shafting, which in turn is geared onto the fifth wheel. The axle is also hinged onto the fifth wheel, which allows the wheels to tilt up and down when passing over stones or into rut holes. This relieves the bed of the carriage from being strained and does away with any plunging motion.

"The motor and working gear is entirely out of sight, except the lower portion of the driving disc, as shown in drawing, and is covered over and protected from dirt and moisture. It requires five gallons of water to fill the cooling tubes and small reservoir. The gasolene store-tank has a capacity of 10 gallons, sufficient to carry two persons 400 miles, and the cost of running will be from 2 to 5 cents per hour, at the rate of 15 miles an hour, on level roads.

"The explosive charge is ignited by an electric igniter of original pattern. The Gardner Igniter will also be used in connection with ours, as I believe it serves to lengthen the life of the battery and igniter connections, the electric igniter being required to start the motor, after which the current may be turned off if desired. The weight of the carriage will be about 650 pounds with tanks filled ready for use."

A company is being organized by Mr. Allen to manufacture these carriages.

An Unpatented Carriage by Patent Attorneys.

Higdon & Higdon, patent attorneys, of St. Louis, Mo., have built for their own private use a motor carriage which was recently brought out on the streets of Kansas City where the firm had a branch and where the carriage was built.

This vehicle is regarded by its designers as the most powerful and efficient of its size and weight yet constructed.

It is propelled by a 7-hp gasolene motor, built by the Weber Gas & Gasolene Engine Company, Kansas City, Mo., and is geared to make from three to fifteen miles an hour. It made such a record as a hill climber in Kansas City, that the remark was commonly heard that it "could go up stairs."

The motor is hung on coil springs directly from the axles, and independently of the body of the vehicle, while the body is supported on four separate springs of its own.

The vehicle is started and stopped by means of a friction clutch.

Power is applied to the rear axle by means of a single sprocket and chain, but the rear wheels are supplied with clutches so that one may turn faster than the other in rounding a corner.

A muffler is said to so reduce the noise of the exhaust that it can hardly be heard across the street.

Two very wide reversible car seats are fitted to the body, each capable of seating three persons, and there is ample room for another seat if desired, so that a total seating capacity of nine may be obtained.

In regard to the vehicle and the rights thereof, Messrs. Higdon & Higdon say:

"Although we are patent lawyers, there is no patent on this vehicle, and every one is perfectly free to copy it, providing

they purchase the patented parts from the makers, as we did. We do not propose to build the vehicles, as it is entirely out of our line. We use our vehicle much the same as the owner of a common carriage uses it, with the exception that ours has no animals to get frightened and run away."

The Washburn Motor Car.

George A. Washburn, of Cleveland, O., has devised an arrangement consisting of a gasolene engine, dynamo-motor and storage battery combination, which seems to be closer to a solution of a self-contained motor car than any thus far devised. The engine has only a moiety of the maximum power required and the combination is thus operated. When the car is running on level stretches the motor or engine may be used alone, and when descending a grade the power is cut off from the car axles and the motor operated as a dynamo, charging the cells; when ascending a grade the engine and motor both propel the car, the latter energized by the storage cells.

Oil Motor Tractors.

The Hornsby-Akroyd oil engine, one of the best-known in the world for stationary purposes, is now being adapted to traction, according to *Engineering*. The illustrations on the opposite page show two types of tractors recently constructed by R. Hornsby & Sons, Ltd., of Grantham, England. The tractor depicted in Fig. 1 is a specimen of the smallest size made, being capable of hauling 20 to 25 tons along good roads on the level, 8 to 10 tons up an incline of 1 in 16, and 6 to 7 tons up an 8½ per cent. grade. It is, moreover, sufficiently powerful to drive a 4-foot 6-inch threshing machine, with its straw elevator. The engine is mounted on an iron or steel framing. By means of gearing it can be run at three different speeds, all the wheels involved being steel castings. The main axle is fitted with compensating gear, so that sharp turns can be taken without casting loose one of the driving wheels, while an efficient brake prevents the possibility of the engine running away. The oil tank will hold about one and one-half day's supply of oil, and, as only about 60 gallons of water are required for cooling purposes the man

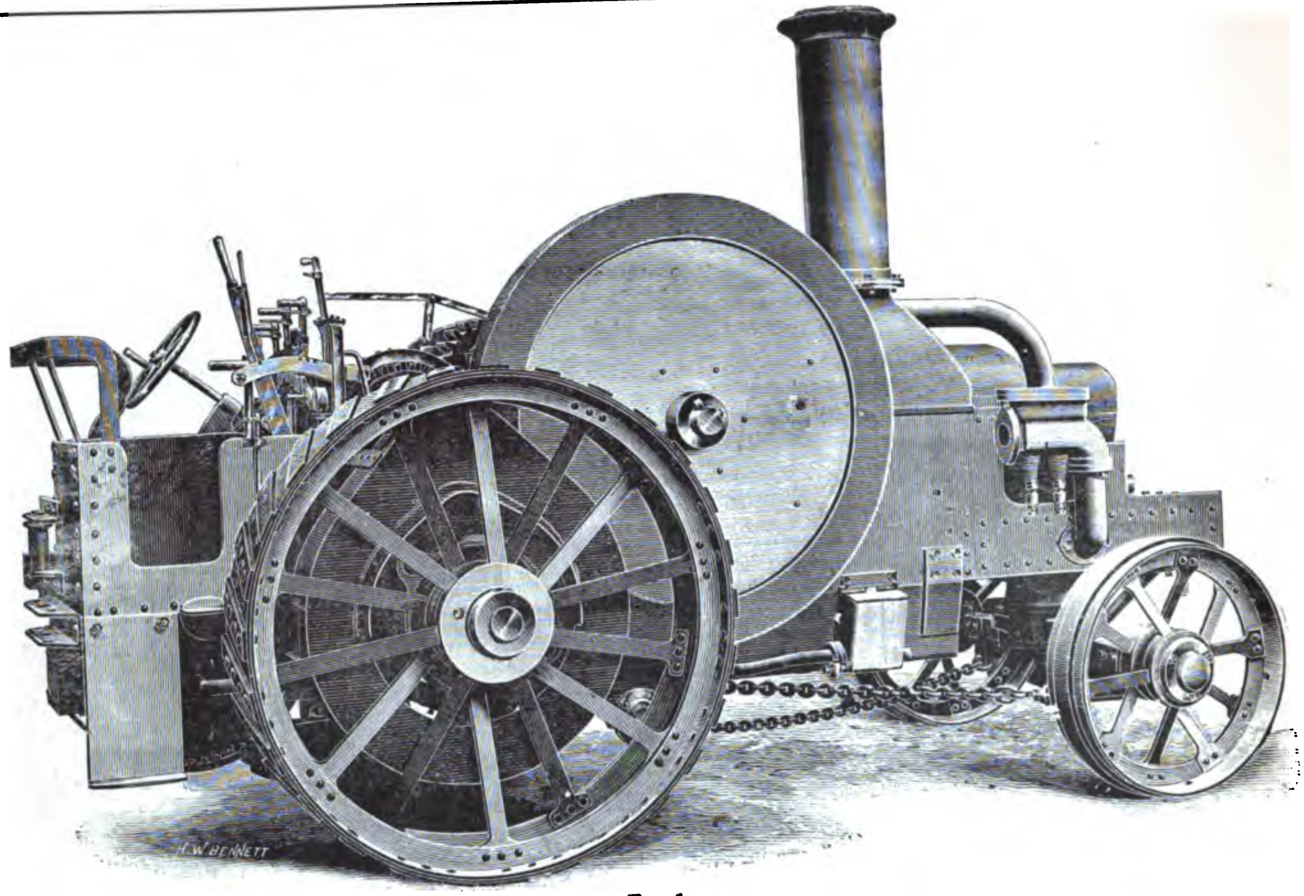


FIG. 1.

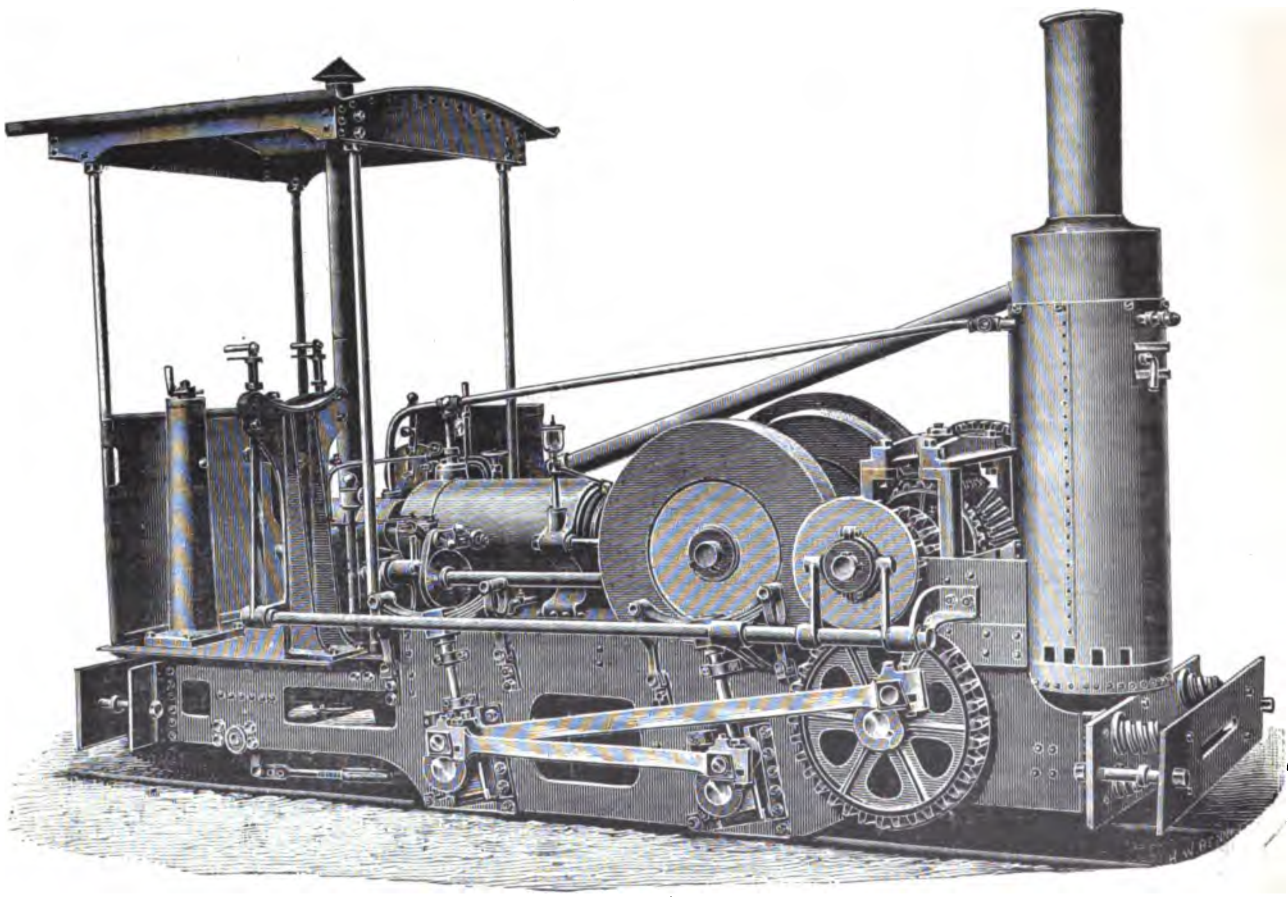


FIG. 2.

OIL MOTOR TRACTORS. R. HORNSBY & SONS, LTD., GRANTHAM, ENGLAND.

and horse usually required to haul water for a steam engine of similar capacity can be practically dispensed with. Further, no coal has to be loaded, the oil used instead being much more easily handled, and a single barrel holding 400 pounds will suffice to run the engine for about three days. Special arrangements have been made to silence the exhaust, which is sometimes painfully emphatic in the case of explosion engines. On the road the driver's duties are much less trying than in the case of a steam engine. There are no water or steam gauges to be looked after, nor fire needing constant attention, so that one man is quite capable of looking after the machinery unaided. Four sizes of the engine are made, the largest being about double the power of that illustrated.

The engine shown in Fig. 2 was constructed for the Woolwich Arsenal, where a locomotive was required with which there would be no danger of sparks escaping with the exhaust gases from the funnel. Like the traction engine previously described, this locomotive requires an extremely small supply of water, and would accordingly appear to be well fitted for use in arid districts. The work of running the engine being so much less than in the case of a steam locomotive, one man suffices to run it, the stoker's services being dispensed with. The reversing gear is of the clutch type, the parts being of steel. Springs are fitted as usual in locomotives, and all the necessary accessories are supplied. It will, however, be seen that buffers have been omitted, since the Arsenal authorities wished to fit these themselves. One advantage of these engines, as compared with steam motors, is the rapidity with which they can be started when cold, 15 minutes being sufficient for this.

A Compressed Air Carriage.

For some time past experiments in compressed air motors have been conducted at the factory of the American Wheelock Engine Company, Worcester, Mass. These experiments have been very exhaustive, covering the application of compressed air motors to both track and road vehicles. To gather data for the latter class of vehicles, the Pneumatic Carriage Company, which is the name of the company working in this particular line, have just completed a two-seated carriage, which was publically exhibited in a procession held on Flag Day, Oct. 31, in the streets of Worcester, although close inspection was not allowed, inasmuch as the present vehicle is merely experimental and the company are not yet prepared to furnish specific information. President Hoadley states, however, that the experiments will be continued until a thoroughly satisfactory model is obtained, when steps will be taken to introduce compressed air vehicles for public service in cities.

The Pneumatic Carriage Company has New York offices at 253 Broadway, connected with those of the American Wheelock Engine Company.

An Historical Subject.

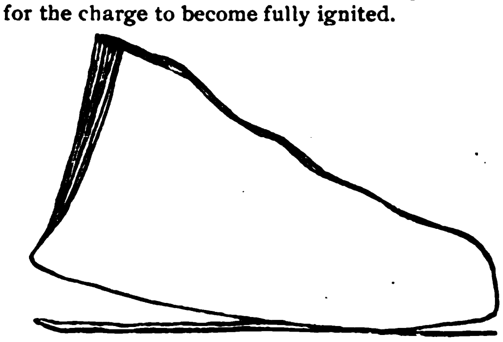
Andrew L. Riker, president of the Riker Electric Motor Company, Brooklyn, N. Y., winners of the first prize at Providence, is no novice in the motor vehicle field. As long ago as 1890 he constructed an electric tricycle, employing for the purpose an old Coventry tricycle, to which he applied a small one sixth hp Riker electric motor and four cells of storage battery. The entire equipment weighed 150 pounds, and would run at a speed of eight miles an hour for four hours over a good road.

ELECTRIC TRICYCLE. A. L. RIKER.

Indicator Card of the King Motor.

The indicator card below is an exact reproduction of one recently taken from a King Motor. The striking feature of this card is claimed to be the perfect and free exhaust line, a result not accomplished by means of noisy cams, but by a new arrangement of ports.

The slight wave noticed in the expansion curve is probably due to vibrations in the indicator cord, which, in this case, was fine wire, as the motor was running at about 500 revolutions per minute. The card shows over six indicated horse-power, and brings out the interesting fact that an appreciable time is taken for the charge to become fully ignited.



Recent improvements have been made in this motor, and while the weight and consumption of gasolene have not been increased, yet the available horse-power at the brake is now said to be about 4½.

The manufacturer of these motors, Charles B. King, of 112-114 Antoine Street, Detroit, Mich., is maintaining his reputation by using the highest grade materials and having perfect workmanship throughout.

Besides a large number of orders for horseless carriage motors he has a number for motors for light inspection cars.

Rules Governing the Use of Motor Vehicles in Paris.

Notice.—Concerning the working and circulation on the public roads, in Paris and in the suburbs under the control of the Prefecture of Police, of motor vehicles other than those that run on rails.

PARIS, 14th August, 1893.

WE, PREFECT OF POLICE, According to:

1. The regulations of the Consular Courts of 12th Messidor, An. VIII.; 3rd, Brumaire, An. IX.

2. The law of the 7th—14th August, 1850.

3. The law of the 10th—15th June, 1853.

4. The order of the Minister of Public Works, dated 20th April, 1866.

5. The Articles 471 and 475 of the Penal Code.

Considering that the adoption of motor vehicles on the territory controlled by the Prefecture of Police has developed to a considerable degree, it is necessary, in the interest of public security, to make regulations for the circulation and working of the same.

According to the reports and notifications of the Chief Engineer of Mines charged with the inspection of steam motors in the Department of Seine.

According to the letter of the Minister of Public Works, dated the 9th May, 1893.

According to the report of the Chief of the 2nd Division,

IT IS ORDAINED

the use on the public ways, in Paris and in the suburbs, under the control of the Prefecture of Police, of motor vehicles (except those running on rails) is subject to the following restrictions:

RULE I.

1. No motor vehicle, except one running on rails, can be used without a regular authorization granted by us on the demand of the owner. This authorization can at all times be cancelled by us, at the instigation of the engineers.

2. Applications for the authorization referred to in Article I. must be submitted in duplicate, one copy being written on stamped paper.

It must specify:

1. The principal dimensions and weight of the vehicles, the weight of its supplies and the maximum load per axle-tree.

2. The description of the motor system, the specification of the materials producing the motive-power and their conditions of use, the definition of the mechanism for warning and stopping.

3. The name and address of the constructor of the vehicle, of its motor parts and mechanism for stopping.

4. The trials and experiments to which the different parts of the vehicle have been submitted.

5. Its special number. (The vehicles manufactured by the same constructor must bear a distinctive number, so as to avoid the possibility of the motors of one manufacturer being taken for those of another.)

6. For what purpose the motor will be used.

7. The public routes on which it will run.

8. Information as to the place where the machine will be stabled.

The application must be accompanied by complete drawings of the vehicle, of its motor system, and of the stopping mechanism.

9. This application will be forwarded to the Chief Engineer of Mines, who is also Inspector of Steam Motors in the Department of the Seine.

The Chief Engineer will either inspect the vehicle himself, or have it inspected so as to ensure its fulfilling the clauses of Rule II. of the present regulations, and also to ensure its not causing danger to the public.

He will make one or more experiments, or have them made, in order to fully understand the working of the motor, and verify the efficiency of its stopping mechanism.

If the maximum load per axle-tree, verified by the Services of Mines, is over 4,000 kilograms, the application will then be communicated to:

1. As regards vehicles circulating in Paris, to the Chief Engineer of the Public Way.

2. As regards the vehicles running in the suburbs of Sevres, St. Cloud, Meudon, and Enghien, to the Engineer of the Ordinary Service of Public Works for the Department of Seine-et-Oise.

These Chief Engineers must satisfy themselves that the vehicles are so constructed that their circulation on the roads on which they are authorized to run is not a cause of danger to the general traffic or of damage to the said roads.

4. The authorization will be delivered in book-form containing the text of the present by-laws.

5. The authorization will specify the particular conditions in which each license is granted to the owner of an autocar; it is, however, liable to be amended from time to time, as circumstances may render necessary, and does not under any circumstances over-ride or prejudice local by-laws.

This authorization will specially fix the maximum load per axle-tree.

Except under special circumstances necessitating a reduction, the load will be fixed at 8,000 kilograms. The authorization can, however, if necessary, increase this weight.

6. The authorization will fix the maximum speed inside and outside Paris, according to the efficiency of the brake power.

This maximum shall not exceed 12 kilometres per hour within Paris and the surrounding suburbs. It may, however, be increased to 20 kilometres in the country, this last maximum being permitted only in thinly-populated localities. These maxima must never be exceeded—the driver of the vehicle, on the contrary, must at all times reduce his speed below them when circumstances necessitate his doing so.

7. In case of a vehicle changing owners, or of one which does not fulfill the standard of the verifications described by these regulations, or if the vehicle is altered after the authorization has been issued, the said authorization becomes null and void, and the vehicle may not be used until a new authorization has been applied for and granted.

RULE II.

DEPOSITIONS REGARDING MOTORS.

8. The reservoirs, pipes and other pieces made to contain explosive or inflammable products shall be constructed and kept perfect so as to be always air tight.

No apparatus leaking in such a way as to cause imminent danger of explosion is to be used.

9. The apparatus must be constructed and managed so as to prevent any risk of fire or explosion.

10. The width of the vehicles, measured between the projecting parts, shall not exceed 2m. 50.

The tires of the wheels must be of smooth surface without any projecting parts.

11. The apparatus must work in such a way as not to frighten horses, either by the steam, smoke, noise, or from any other cause.

12. In cases where a system for throwing out of gear is employed, efficacious means must be taken to prevent the vehicle running away in the event of the gear becoming engaged when supposed to be released.

13. All safety gauges, etc., which need consulting while the vehicle is running, shall be placed in good view of the conductor, and be lighted up at night if necessary.

Nothing shall hide the view of the conductor in front of the machine, and the different apparatus, etc., must be placed so as to enable him to use them without discontinuing to watch the road.

14. The vehicle must be provided with a special mechanism permitting it to turn corners of small radius.

15. The vehicle must be furnished with two distinct brakes and with two methods of bringing these brakes into action—one independent of the other. By the action of one only of these brakes the machine must stop at once, even when the motor is running its maximum speed. The two methods of bringing the brake into action must act independently, and be sufficiently powerful to apply the brakes instantaneously.

16. The different parts of the motor, the safety apparatus, the brakes and the levers for bringing them into action, the axles-trees, etc., shall at all times be kept in perfect working order. With this object the owner shall get his vehicle examined and verified periodically, and make in good time all necessary repairs, according to the rules of the trade.

Particulars regarding the periodical inspections and repairs shall be fully specified in the book named in Article IV.

17. Each motor vehicle shall bear on a metal plate and in legible writing the name and address of its owner, also the distinctive number used in the application for authorization. This plate shall be placed at the left hand side of the vehicle —it shall never be hidden.

RULE III.

DEPOSITIONS REGARDING THE DRIVING AND CIRCULATION OF THE VEHICLES.

18. No one shall have the right to drive one of the motor vehicles specified by the present until he has obtained from us a certificate of competency applicable to the motor he is driving.

The said certificates will not be delivered to candidates under 21 years old. The candidate shall supply, in support of his application, a copy of his certificate of birth and two copies of his photograph—each photograph must be of the following dimensions: Two centimetres wide and three centimetres long—and also an authentic certificate of his address. One of the two copies of the photograph shall be attached to the certificate.

All candidates must give proofs to the Chief Engineer of Mines charged with the inspection of steam motors or to his representative:

1. That he has the necessary experience for working, starting, stopping and driving the vehicle.

2. That he is capable of recognizing whether the different parts are in good working order, and of taking the necessary measures for preventing explosions or any other accident.

3. That he is capable, if necessary, of repairing small damages.

The certificate thus delivered is revocable at the will of the Chief Mining Engineer.

For vehicles worked by steam these certificates will take the place of those imposed by Article 12 of the "Ordonnance of Jan. 3rd, 1888," regarding the working of steam motors on the public way.

19. The driver of a motor vehicle shall always carry with him the special authorization referring to the vehicle, and also his personal certificate, and must exhibit these papers at all times at the request of the agents and other recognized authorities charged to inspect the motors.

20. A driver is never to leave his vehicle, either when it is in motion or when it is standing still, unless he has done everything necessary to prevent the explosion of the motor apparatus, the running away of the vehicle, excessive noise, etc., and he must leave it in charge of some other person for whom he holds himself personally responsible.

21. The motor vehicle must be fitted with a sufficient number of levers to ensure the proper working of the different parts, more especially of the brakes.

22. When the vehicles are running, the drivers must watch the state of the road and also the approach of other vehicles or foot passengers, and decrease the speed or stop if necessary. They must also obey all alarm signals made to them.

They must not under any circumstances exceed the maximum speed fixed by the authorization. They must, however, reduce the speed under this maximum when necessary, taking into consideration the facilities for stopping at their disposal, the state of the different parts of the mechanism, the state of the road, the possible slipping of the machine when it stops, and also atmospherical circumstances. In addition to this, they must verify frequently by use the good working order of both the two levers of the brakes.

23. Speed must be diminished or the vehicle stopped altogether when there is a prospect of frightening horses or other animals, and thus causing disorder or accident.

In every case speed must be reduced to that of a man walking in all market places and narrow streets, where two carriages cannot pass abreast, also when passing custom houses, gates, or barriers, when turning street corners, at the intersection of streets, when going over bridges, and at all places where the ground slopes down, or where there is an obstacle in the way of traffic. Drivers are not in such cases to put on a greater speed until they are certain that such can be maintained without inconvenience to the public.

24. The vehicles must give warning of their approach when necessary by means of a trumpet horn, or other instrument of the same kind. They must not, however, make a noise similar to that of a steam whistle.

Independently of the warning instrument referred to above, which must be placed within reach of the driver, vehicles must be fitted (if they run silently) with a bell (or bells) ringing sufficiently loudly to give warning of their approach. This bell or bells shall ring continuously, and shall not be fitted with any stopping apparatus.

25. Drivers are to take the right-hand side of the road, even if the middle of the road be free. In cases when they are obliged to take the left-hand side in consequence of an obstacle of some sort, they are to recross to the right-hand side as soon as the obstacle has been passed.

26. Vehicles are not allowed to stand on the pavement or side-paths of the boulevards nor on roads or promenades exclusively reserved for pedestrians and riders. They may, however, cross these pavements and paths cautiously, and at walking pace; they may also follow private roads leading to

dwelling houses, but must not remain stationary on such roads.

27. Drivers of vehicles are not allowed to cross funeral or school processions, convoys, etc., neither are they allowed to cross the Paris Central Market before 10 a. m. Racing with drivers or conductors of other vehicles is strictly forbidden.

28. Vehicles are not allowed to stand on the public way except when absolutely necessary ; the standing of the vehicle is prohibited in all cases where it interferes with or impedes general traffic. No vehicle shall stand in a parallel line with another vehicle already standing at the opposite side of the road.

29. Motor vehicles are not allowed to draw one or more carriages attached behind.

30. Vehicles are not allowed to run at night or in foggy weather unless fitted with lanterns or candle-lamps, such lanterns or lamps being under ordinary circustances lit at sunset. These lanterns or lamps must give a white light, and must always be kept in perfect working order. Two such lamps must be placed outside and in front of each vehicle; the distance between them including the total width of the vehicle. They must be sufficiently powerful and so arranged as to enable the driver to see the road and everything in front of him (even if the road is not lighted), and far enough ahead to be able to pull up in time to prevent collision or accident.

31. All accidents to persons, important accidents to vehicles, explosions, etc., are to be reported at once to the Commissaire of Police, and also to us, either by the owner of the vehicle or, he being absent, by its driver.

The damaged vehicle and its parts are not to be moved, unless absolutely necessary, and then only with the consent of the Commissaire of Police, neither are they to be altered until after any inquiries which may be made are closed.

RULE IV.

GENERAL DEPOSITIONS.

32. With regard to points not specially referred to in these by-laws, mechanical motor vehicles will be controlled by the following laws:

1. To the laws and regulations regarding vehicles, specially to the Regulations and Rules I and III of the law of August 15, 1852.

2. If the motor is a steam motor, to the laws and regulations on steam machines, especially to those of April 30, 1880, and to the Order of the "Prefect de Police,"dated Jan. 3, 1888; it is understood, however, that Articles 14 and 15 of this order are not applicable to the said vehicle.

33. Any violation of the present order shall be notified by a *procès verbaux*, which must be sent to us so as to be transmitted to the Public Prosecutor.

34. The Chief Engineer of Mines charged with the inspection of steam motors in the Department of the Seine, and also the engineers or agents under him, shall, under our direction, and with the assistance of the local authorities, superintend the carrying out of the measures prescribed by the present order, more especially Rules I. and II. The Chief Engineer of the Service of the Public Way in Paris, the chief engineers under him, the Chief Engineers of Public Works for the Department of Seine and Seine-et-Oise, and all agents placed under them, shall also omit according to Rules I. and III.

The "Chef de la Police Municipale," the Commissaires of Police of the City of Paris and of the suburbs under the control of the Prefecture of Police, the police officers and all other agents of the administration are requested to give help to the engineers and agents mentioned above, so as to ensure the good execution of the measures described in Rule III.

35. The present order shall be printed and posted up.

Copy of the same shall be sent to the "Chefs de Service" mentioned in Article 34, to the Colonel commanding the "Légion de la Garde Républicaine," and to the Colonel commanding the "Légion de Gendarmerie de la Seine," to enforce its execution by all the means at their disposal.

By the Prefect of Police. Le Perfect de Police.
General Secretary, E. LAURENT. L. LÉPINE.

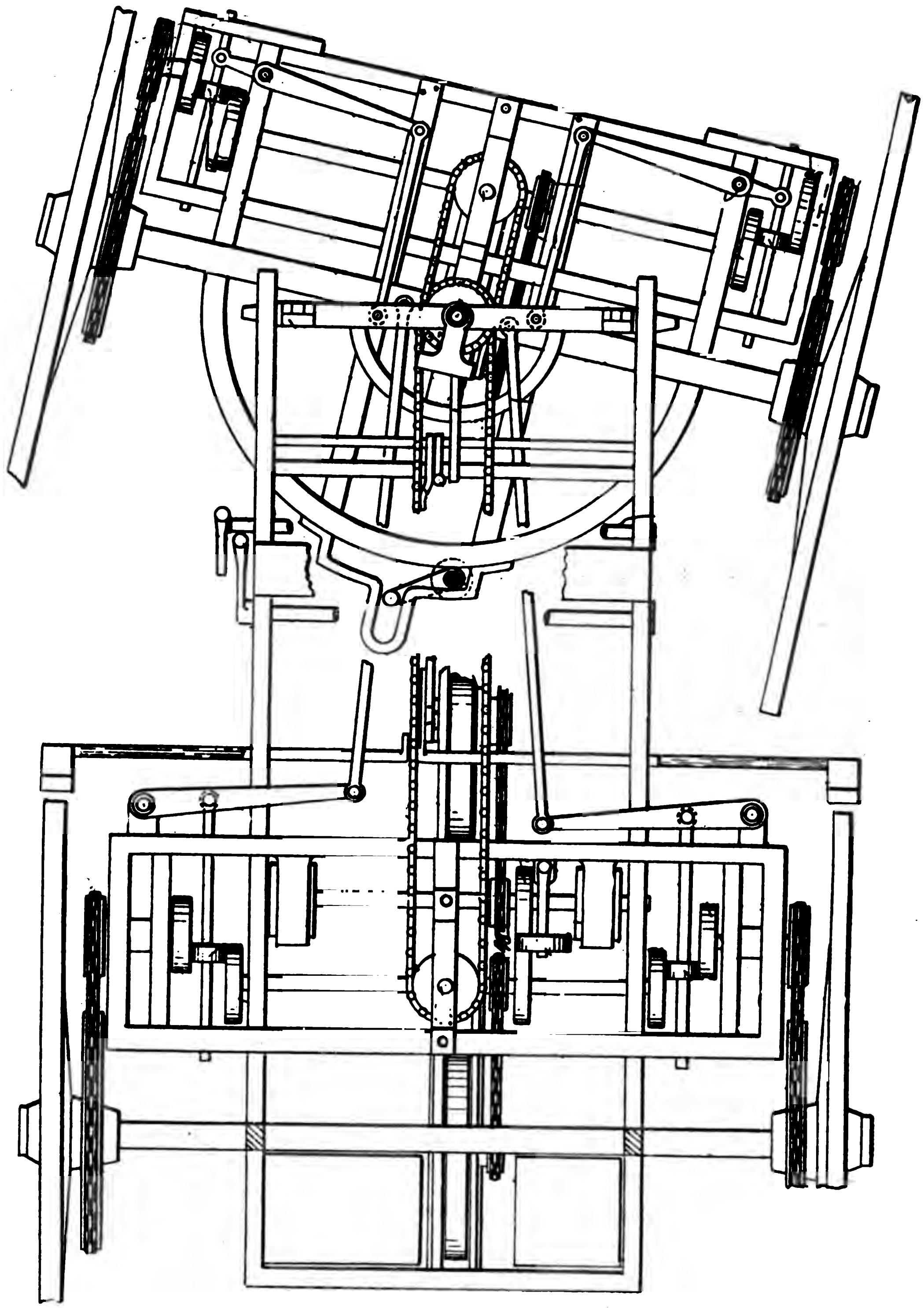
N. B.—Since these laws have been brought into force another has been passed, which allows a permit to motor cars, bearing a special license, to stand on any cab ranks, and to ply for hire as an ordinary Paris *fiacre*. Up to the present, however, the manufacturers have not brought out a real cab specially built like a hanson, although several are in course of construction.

THE AUTOCAR.

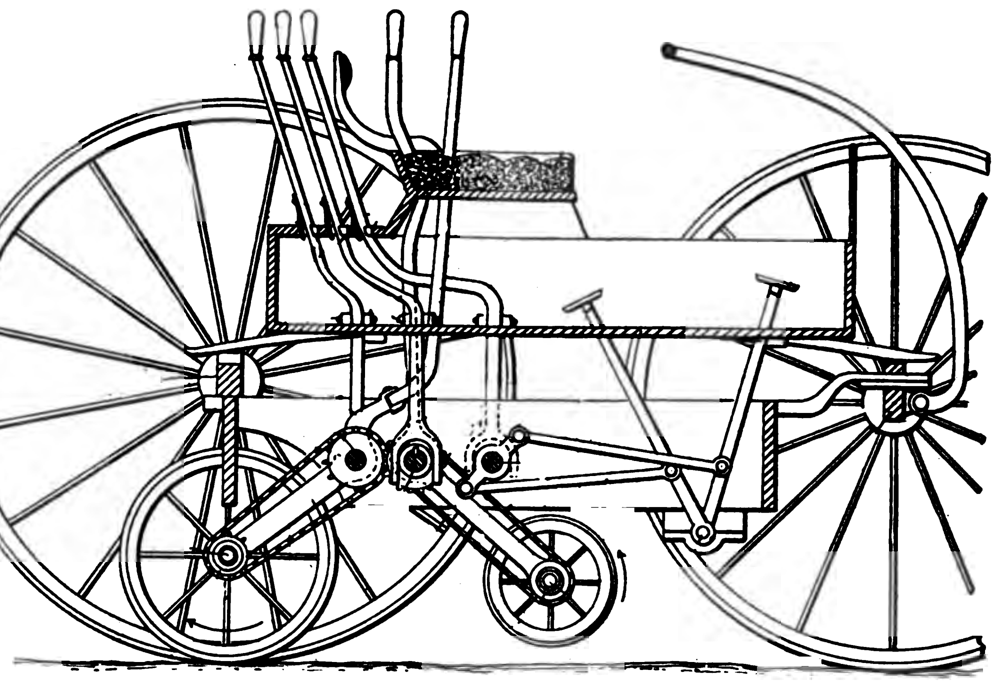
The Haviland Vehicle Driving Gear.

The Haviland Vehicle Driving Gear has been designed by F. W. Haviland, 210 West 123d Street, New York, to overcome the many disadvantages which the inventor sees in the present motor wagon. The drawings here shown are taken from the patent papers, and do not show the various combinations in which the gear can be utilized. For a light runabout buggy a single propelling wheel under the front axle will be used. For a road wagon in a hilly country the front and rear propelling wheels will be used, the rear wheel geared for slow work or for climbing hills, and the front wheel geared for speed. For light delivery work the two propelling wheels combined with the backing wheel will be used, or the propelling wheels may be dispensed with altogether and the power applied to all four of the running or supporting wheels. For heavy delivery or trucking the full combination of the gear will be required.

The object of the independent propelling wheel is to provide a friction surface with the ground that will not slip and that will utilize the weight of the wagon and load as friction power, thus doing away with the necessity of either serrated or rubber tires. By having power applied to both front and rear, the inventor claims the propelling power is always exerted in the direction of the rotation of the wheels, thus overcoming any difficulties in turning round. The compensating gears regulating the driving sprockets of the supporting wheels act in such a manner as to exert a traction power to each and all of the wheels whether going straight ahead or on a curve. They also provide a very powerful and easy control over the swinging of the front axle, ensuring a positive steering gear. For light work provision is made for the motor or engine under the body of the vehicle and for heavy delivery work the motor and shaft gearing will be located on the front truck, where they will be constantly under the eye of the operator and independent of the body of the vehicle. The inventor believes he has taken a great step toward the production of a practical delivery wagon so much needed in our large cities.



VEHICLE DRIVING GEAR. FRANK W. HAVILAND, NEW YORK.



FRICTION DRIVING WHEELS. F. W. HAVILAND, NEW YORK.

Gas Exposition at Madison Square Garden.

The artificial gas interest of this country is an exceedingly important one. There are in the neighborhood of 1,200 cities and towns of the United States lighted in large part by manufactured gas. In addition there are thousands of homes in which gas is being largely, if not wholly, employed for cooking and heating purposes. About $600,000,000 is invested in gas works property in this country, the gas interest being second in importance perhaps only to the investment in railroad properties.

The gas industries propose to hold an exposition at Madison Square Garden, New York City, opening on Jan. 27, 1897 and holding for two weeks, at which will be shown every practical apparatus and appliance entering into the manufacture or distribution of gas as an illuminating or heating agent.

Several well known manufacturers of gas engines will exhibit, and the managing director, E. C. Brown, 280 Broadway, would like to introduce some of the new motor carriages as a feature of the exhibition.

Wire Carriage Wheels.

The Weston-Mott Company, Jamesville, N. Y., have issued their new catalogue, containing, besides a full exposition of their well-known line of bicycle parts, a description of a new ball-bearing carriage wheel, which they have constructed specially for the motor trade.

The spokes are set straight or tangent, as the customer may prefer. They are headed and bent on one end and passed through the hole in the hub flange, while the other end is threaded and attached to the rim with a heavy brass nipple, making a strong and sightly finish, and a spoke can be more easily replaced than if fastened in any other manner.

The finish is black or maroon enamel, baked on, except the outside hub cap, which is of white polished metal, forming an attractive contrast.

These wheels are made in 28, 30, 32 and 34 inch sizes and other sizes may be had to order.

Improvements in the New York Motor.

The New York Motor Company, 11 Murray street, New York City, are making a number of minor improvements in their motors. They have abandoned packed joints entirely, because of their liability to blow out, and now use ground joints only.

The piston they now pack with asbestos to keep it cool, save oil and odor, and increase the general efficiency of the motor.

After considerable experimenting they have perfected a hot tube igniter, which requires 5,000 degrees Fahr. to melt it, and is much cheaper than the platinum igniter usually employed. This igniter they guarantee for eight months, ten hours run a day, and recommend it for boats and vehicles when protected by a wind guard. For yacht tenders they recommend the electric ignition.

L. Epstein, East Twickenham, Middlesex, England, was recently granted a patent on a system of recharging storage batteries used for propelling vehicles or boats, by converting the motor into a dynamo, uncoupling it from the motor shaft and coupling it to a small subsidiary engine.

Regulations Governing Motor Vehicles in England.

The Local Government Board, which was empowered by Parliament to make regulations to govern the use of motor vehicles under the new act, made the result of its deliberations public on the 14th. The following is the text:

To the county councils of the several administrative counties in England and Wales;

To the councils of the several county boroughs in England and Wales;

To the sanitary authorities of the several sanitary districts in the administrative county of London;

To the urban district councils of the several urban districts in England and Wales;

To the rural district councils acting as the highway authorities in rural districts in England and Wales;

And to all others whom it may concern.

Whereas by Section 6 of the Locomotives on Highways Act, 1896 (hereinafter called "the Act"), it is enacted that:

1. The Local Government Board may make regulations with respect to the use of light locomotives on highways and their construction, and the conditions under which they may be used.

2. . . . All regulations under this section shall have full effect notwithstanding anything in any other Act, whether general or local, or any by-laws or regulations made thereunder.

And whereas by Section 7 of the Act it is enacted that:

During the period between one hour after sunset and one hour before sunrise, the person in charge of a light locomotive shall carry attached thereto a lamp so constructed and placed as to exhibit a light in accordance with the regulations to be made by the Local Government Board.

And whereas by Section 2 of the Act it is enacted that:

A breach of any . . regulation made under this Act . . . may, on summary conviction, be punished by a fine not exceeding £10.

Now, therefore, in pursuance of the powers given to us by the Act, and by any other statutes in that behalf, we, the Local Government Board, do by this, our order make the following regulations with respect to use of light locomotives on highways, and their construction, and the conditions under which they may be used, and direct that the same shall have effect on and after the fourteenth day of November, one thousand eight hundred and ninety-six.

ARTICLE I.—In this order:

The expression "carriage" includes a wagon, cart, or other vehicle.

The expression "horse" includes a mule or other beast of draught or burden, and the expression "cattle" includes sheep.

The expression "light locomotive" means a vehicle propelled by mechanical power which is under three tons in weight unladen, and is not used for the purpose of drawing more than one vehicle (such vehicle with its locomotive not exceeding in weight unladen four tons), and is so constructed that no smoke or visible vapor is emitted therefrom, except from any temporary or accidental cause.

In calculating for the purposes of this order the weight of a vehicle unladen, the weight of any water, fuel, or accumnlators used for the purpose of propulsion shall not be included.

ARTICLE II.—No person shall cause or permit a light locomotive to be used on any highway, or shall drive or have charge of a light locomotive when so used, unless the conditions hereinafter set forth shall be satisfied, namely:

1. The light locomotive, if it exceeds in weight unladen five hundredweight, shall be capable of being so worked that it may travel either forward or backward.

2. The light locomotive shall not exceed six and a half feet in width, such width to be measured between its extreme projecting points.

3. The tire of each wheel of the light locomotive shall be smooth and shall, where the same touches the ground, be flat and of the width following, namely:

(*a*) If the weight of the light locomotive unladen exceeds 15 hundredweight, but does not exceed one ton, not less than two and a half inches;

(*b*) If such weight exceeds one ton, but does not exceed two tons, not less than three inches;

(*c*) If such weight exceeds two tons, not less than four inches.

Provided that where a pneumatic tire or other tire of a soft and elastic material is used, the tire may be round or curved, and there may be upon the same projections or bosses rising above the surface of the tire if such projections or bosses are of the same material as that of the tire itself, or of some other soft and elastic material. The width of the tire shall, for the purpose of this proviso, mean the extreme width of the soft and elastic material on the rim of the wheel when not subject to pressure.

4. The light locomotive shall have two independent brakes in good working order, and of such efficiency that the application of either to such locomotive shall cause two of its wheels on the same axle to be so held that the wheels shall be effectually prevented from revolving, or shall have the same effect in stopping the light locomotive as if such wheels were so held.

Provided that in the case of a bicycle this regulation shall apply as if, instead of two wheels on the same axle, one wheel was therein referred to.

5. The light locomotive shall be so constructed as to admit of its being at all times under such control as not to cause undue interference with passenger or other traffic on any highway.

6. In the case of a light locomotive drawing or constructed to draw another vehicle or constructed or used for the carriage of goods, the name of the owner and the place of his abode or business, and in every such case and in the case of every light locomotive weighing unladen one ton and a half or upward, the weight of the light locomotive unladen shall be painted in one or more straight lines upon some conspicuous part of the right or off side of the light locomotive in large legible letters in white upon black or black upon white, not less than one inch in height.

7. The light locomotive and all the fittings thereof shall be in such a condition as not to cause, or to be likely to cause, danger to any person on the light locomotive or on any highway.

8. There shall be in charge of the light locomotive when used on any highway a person competent to control and direct its use and movement.

9. The lamp to be carried attached to the light locomotive in pursuance of Section 2 of the Act shall be so constructed and placed as to exhibit, during the period between one hour after sunset and one hour before sunrise, a white light visible within a resonable distance in the direction toward which the light locomotive is proceeding or is intended to proceed, and to exhibit a red light so visible in the reverse direction. The lamp shall be placed on the extreme right or off side of the light locomotive, in such a position as to be free from all obstruction to the light.

Provided that this regulation shall not extend to any bicycle, tricycle or other machine to which Section 25 of the Local Government Act, 1888, applies.

ARTICLE III.—No person shall cause or permit a light locomotive to be used on any highway for the purpose of drawing any vehicle, or shall drive or have charge of a light locomotive when used for such purpose, unless the conditions hereinafter set forth shall be satisfied, namely—

1. Regulations 2, 3, 5 and 7 of Article II. of this Order shall apply as if the vehicle drawn by the light locomotive was therein referred to instead of the light locomotive itself, and Regulation 6 of the Article shall apply as if such vehicle was a light locomotive constructed for the carriage of goods.

2. The vehicle drawn by the light locomotive, except where the light locomotive travels at a rate not exceeding four miles an hour, shall have a brake in good working order, of such efficiency that its application to the vehicle shall cause two of the wheels of the vehicle on the same axle to be so held that the wheels shall be

effectually prevented from revolving, or shall have the same effect in stopping the vehicle as if such wheels were so held.

3. The vehicle drawn by the light locomotive shall, when under the last preceding regulation a brake is required to be attached thereto, carry upon the vehicle a person competent to apply efficiently the brake.

Provided that it shall not be necessary to comply with this regulation if the brakes upon the light locomotive by which the vehicle is drawn are so constructed and arranged that neither of such brakes can be used without bringing into action simultaneously the brake attached to the vehicle drawn, or if the brake of the vehicle drawn can be applied from the light locomotive independently of the brakes of the latter.

ARTICLE IV.—Every person driving or in charge of a light locomotive when used on any highway shall comply with the regulations hereinafter set forth, namely:

1. He shall not drive the light locomotive at any speed greater than is reasonable and proper having regard to the traffic on the highway, or so as to endanger the life or limb of any person, or to the common danger of passengers.

2. He shall not under any circumstances drive the light locomotive at a greater speed than 12 miles an hour. If the weight unladen of the light locomotive is one ton and a half and does not exceed two tons, he shall not drive the same at a greater speed than eight miles an hour, or if such weight exceeds two tons, at a greater speed than five miles an hour.

Provided that whatever may be the weight of the light locomotive, if it is used on any highway to draw any vehicle, he shall not under any circumstances drive it at a greater speed than six miles an hour.

Provided also that this regulation shall only have effect during six months from the date of this order, and thereafter until we otherwise direct.

3. He shall not cause the light locomotive to travel backward for a greater distance or time than may be requisite for purposes of safety.

4. He shall not negligently or willfully cause any hurt or damage to any person, carriage, horse, or cattle, or to any goods conveyed in any carriage on any highway, or when on the light locomotive, be in such a position that he cannot have control over the same, or quit the light locomotive without having taken due precautions against its being started in his absence, or allow the light locomotive or a vehicle drawn thereby to stand on such highway so as to cause any unnecessary obstruction thereof.

5. He shall, when meeting any carriage, horse, or cattle, keep the light locomotive on the left or near side of the road, and when passing any carriage, horse or cattle proceeding in the same direction, keep the light locomotive on the right or off side of the same.

6. He shall not negligently or willfully prevent, hinder, or interrupt the free passage of any person, carriage, horse or cattle on any highway, and shall keep the light locomotive and any vehicle drawn thereby on the left or near side of the road for the purpose of allowing such passage.

7. He shall, whenever necessary, by sounding the bell or other instrument required by Section 3 of the Act, give audible and sufficient warning of the approach or position of the light locomotive.

8. He shall on the request of any police constable, or of any person having charge of a restive horse, or on any such constable or person putting up his hand as a signal for that purpose, cause the light locomotive to stop and remain stationary so long as may be reasonably necessary.

ARTICLE V.—If the light locomotive is one to which Regulation 6 of Article II. applies, and the particulars required by that regulation are not duly painted thereon, or if the light locomotive is one to which that regulation does not apply, the person driving or in charge thereof shall, on the request of any constable, or on the reasonable request of any other person, truly state his name and place of abode, and the name of the owner, and the place of his abode or business.

This order may be cited as "The Light Locomotives on Highways Order, 1896."

Given under the seal of office of the Local Government Board, this 9th day of November, in the year one thousand eight hundred and ninety-six.

HENRY CHAPLIN, *President*,
HUGH OWEN, *Secretary*.

LOCOMOTIVES ON HIGHWAYS. 59 and 60 Vict., cap. 36 s. 5.

In promulgating the following regulations relating to the keeping, conveyance, and use of petroleum in connection with light locomotives, the Secretary of State for the Home Department desires to call public attention to the dangers that may arise from the careless use of those more volatile descriptions of petroleum to which these rules apply, being petroleum to which the Petroleum Act, 1871, applies, and commonly known as "mineral spirit."

Not only is the vapor therefrom, which is given off at ordinary temperature, capable of being easily ignited, but also when mixed with air, of forming an explosive mixture. Hence the necessity for strict precautions in dealing with and handling the same, and for the employment of thoroughly sound and properly closed vessels to contain the some, the importance of avoiding the use of naked lights in dangerous proximity to the same, or to any place where such petroleum may be kept, and generally of taking precautions to prevent contact of the highly inflammable vapor of this very volatile liquid with any form of artificial light.

REGULATIONS.

By virtue of the powers conferred on me by the fifth section of the Locomotives on Highways Act, 1896, I hereby make the following regulations for the keeping and use of petroleum for the purposes of light locomotives.

Save as herein provided, the provisions of the Petroleum Acts shall apply to all petroleum kept or used or sold for the purposes of light locomotives.

In these regulations the expression "petroleum" shall mean the petroleum to which the Petroleum Act, 1871, applies, provided that when any petroleum other than that to which the Petroleum Act, 1871, applies, is on or in any light locomotive or is being conveyed or kept in any place on or in which there is also present any petroleum as above defined, the whole shall be deemed to be petroleum as above defined.

1. Petroleum shall not be kept, used or conveyed, except in tanks or cases of metal so made and closed that no leakage, whether of liquid or vapor, can take place therefrom, and so substantially constructed as not to be liable, except under circumstances of gross negligence or extraordinary accident, to be broken or become defective or insecure in course of conveyance or use; and every air inlet in any such tank or case shall be at all times, except when the valve, if any, is required to be removed for immediate use or repair, protected by securely affixed wire gauze, the openings in which shall not be less in number than 400 to the square inch.

2. Every such tank or case shall be clearly stamped or securely labeled with a legible metallic or enameled label with the words: "Mineral spirit, highly inflammable; for use with light locomotives."

3. The amount of petroleum to be in any one such tank or case at one time shall not exceed 20 gallons.

4. There shall not be at the same time on or in any one light locomotive more than two of such tanks as aforesaid.

5. Before repairs are done to any such tank or case, that tank or case shall, as far as practicable, be cleaned by the removal of all petroleum and of all dangerous vapors derived from the same.

6. When petroleum for use in or in connection with any light locomotive is not being so used, it shall be kept either in accordance with the provisions of the Petroleum Acts, or in such tanks or cases as aforesaid; provided that the amount of petroleum which may be so kept in tanks or cases as aforesaid, shall not exceed the amount of petroleum which may be kept on or in any one light locomotive at the same time, and the tanks or cases shall be kept in the open air, or in some suitably ventilated place.

7. The filling or replenishing of a tank with petroleum shall not

be carried on, nor shall the contents of any such tank be exposed by artificial light, except a light of such construction, position, or character as not to be liable to cause danger, and no artificial light shall be brought within dangerous proximity of the place where any tank containing petroleum is being kept.

8. In the case of all petroleum kept or conveyed for the purpose of or in connection with any light locomotive (*a*) all due precautions shall be taken for the prevention of accidents by fire or explosion, and for the prevention of unauthorized persons having access to any petroleum kept or conveyed, and to the vessels containing or intended to contain, or having actually contained the same; and (*b*) every person managing or employed on or in connection with any light locomotive shall abstain from every act whatever which tends to cause fire or explosion, and which is not reasonably necessary, and shall prevent any other person from committing such act.

9. These regulations shall come into operation on the 14th day of November, 1896, and be in force until further notice.

M. W. RIDLEY.

One of Her Majesty's Principal Secretaries of State.

WHITEHALL, 3d November, 1896.

Motor Carriage Tested at Cleveland.

Alexander Winton, mechanical superintendent of the Winton Bicycle Company, Cleveland, O., tested a motor carriage of his construction last month with very satisfactory results.

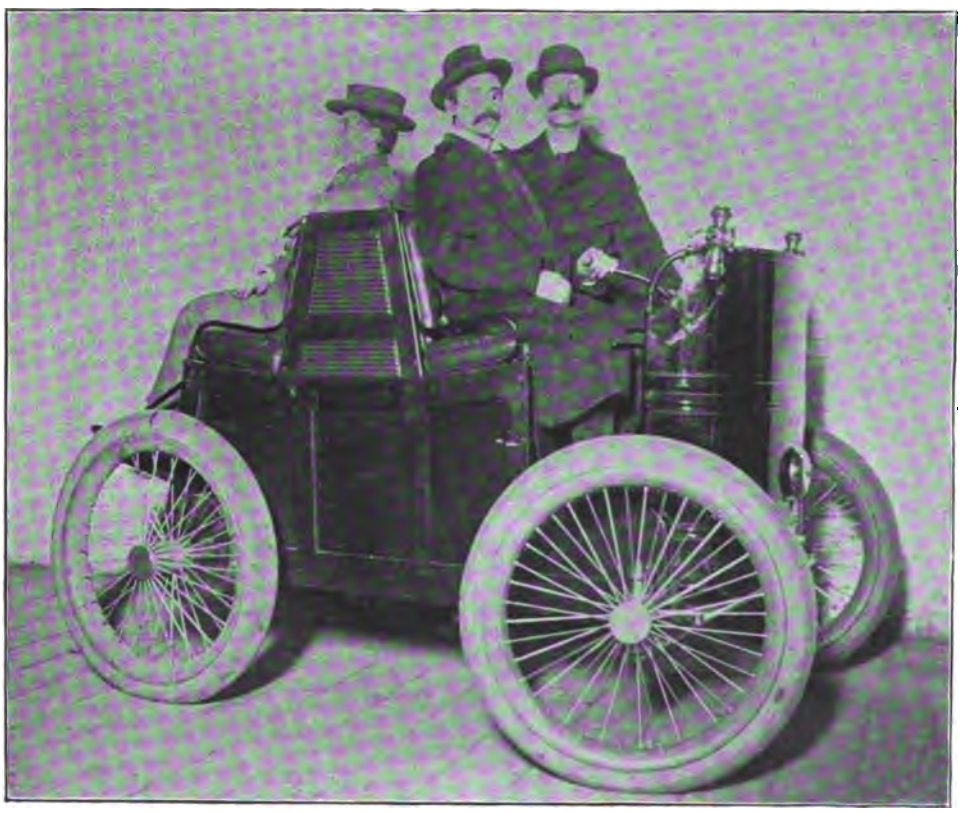
The vehicle, which is propelled by a gasolene motor, has two seats arranged dos-a-dos and bicycle wheels fitted with 4 inch pneumatics. One lever steers the vehicle and controls the speed.

The experimental model will be considerably lightened.

Mr. Winton, in answering a query concerning his invention, said:

"The transmission of gear is not fully covered in the Patent Office yet, so I do not care to say anything on that point just at present. I may say, however, that the Winton vehicle, to carry four persons, will have an eight-hp improved gasolene motor, which is fully covered by patents. The important points are the hydro-carbon feeder, the electric igniter and the regulator. The feeder converts oil to a fixed gas before entering the cylinders, without any of the objectionable feature of the carburettor now in general use. It is very economical in fuel. The igniter is absolutely positive in its workings, requires no adjustment, and will run for years without any attention whatever. The governor is pneumatic and by pressing a button the speed of the motor can be varied from 200 revolutions per minute when running light to 700 or 800 if necessary. The engine is entirely self-oiling, all its working parts being submerged in oil. A condenser or cooler is used to reduce the temperature of water for cylinders. Five gallons are all that is necessary, and it does not attain more than 200 degrees Fahr., so that evaporation is very light. My vehicle for two persons will not weigh to exceed 400 pounds, and will be capable of a speed of 30 miles per hour. Ball-bearings, wood rims, and special pneumatic tires will be used on all Winton vehicles."

The Maginn Power Generator & Motor Company, Chicago, Ill., have completed their new three-cylinder vertical motor, for marine and stationary use. It receives an impulse at each third of a revolution, or three impulses each revolution, and is specially designed for yachts.



TWO-SEATED MOTOR CARRIAGE.—ALEXANDER WINTON, CLEVELAND, OHIO.

Haynes & Apperson's New Model.

Elwood Haynes, of Haynes & Apperson, Kokomo, Ind., has had a varied experience with gasolene motors for vehicle propulsion. Some two years ago, after carefully comparing the different motors, from a theoretical point of view, and deciding in favor of gasolene, he made an attempt to find in the market a suitable motor for the purpose. This proved to be a very difficult task, as at that time all the motors that could be purchased were too heavy and gave too much vibration. Fnally, however, a motor was selected and purchased, but it gave such severe vibration when in motion that it was found necessary to build the carriage much heavier than at first intended, in order to provide for this.

Though the motor was only rated at one horse-power, it drove the carriage at the rate of six miles an hour on a level pike, and ran it one and a half miles without a stop, carrying three passengers, the first time it was set in motion. It did not prove sufficiently powerful, however, even when geared at low speed, to surmount hills, as the carriage and equipment weighed 920 pounds without passengers, and it was afterward replaced by another motor weighing about 300 pounds, and rated at 2 horse-power, which brought the weight of the carriage up to 1,050 pounds.

The carriage is still in use in Kokomo, and makes a maximum of 10 miles per hour on a good level pike. It is fitted with 1½-inch solid rubber tires and rides very easily, as the motor is set on the frame of the carriage and transmits no vibration to the passengers.

The second construction he undertook was on the same general plan as the first, but the motor was of original design and manufacture. It is on the same plan as the one employed in the *Times-Herald* contest last November, and consists of a double-cylinder horizontal gasolene engine, giving an impulse in each cylinder at each revolution. This motor runs very smoothly, affords four horse-power under the brake, and weighs 300 pounds including the 110-pound balance wheel. The cast portions are made of an alloy of aluminum and weigh 56 pounds. It will be seen, therefore, that the chief weight is in the pistons, connecting rods, crank shaft and balance wheel.

The trap, propelled by this motor, weighs, empty, 1400 pounds and carries four passengers. It is fitted with 2-inch pneumatic tires, obviating the necessity of setting the motor on springs.

They have also built a second motor constructed on the same general plan as the first, except that the Otto cycle is used instead of the Clerk. It has two cylinders, gives an impulse at each revolution, weighs 340 pounds, and develops eight horse-power. (See Illustration.)

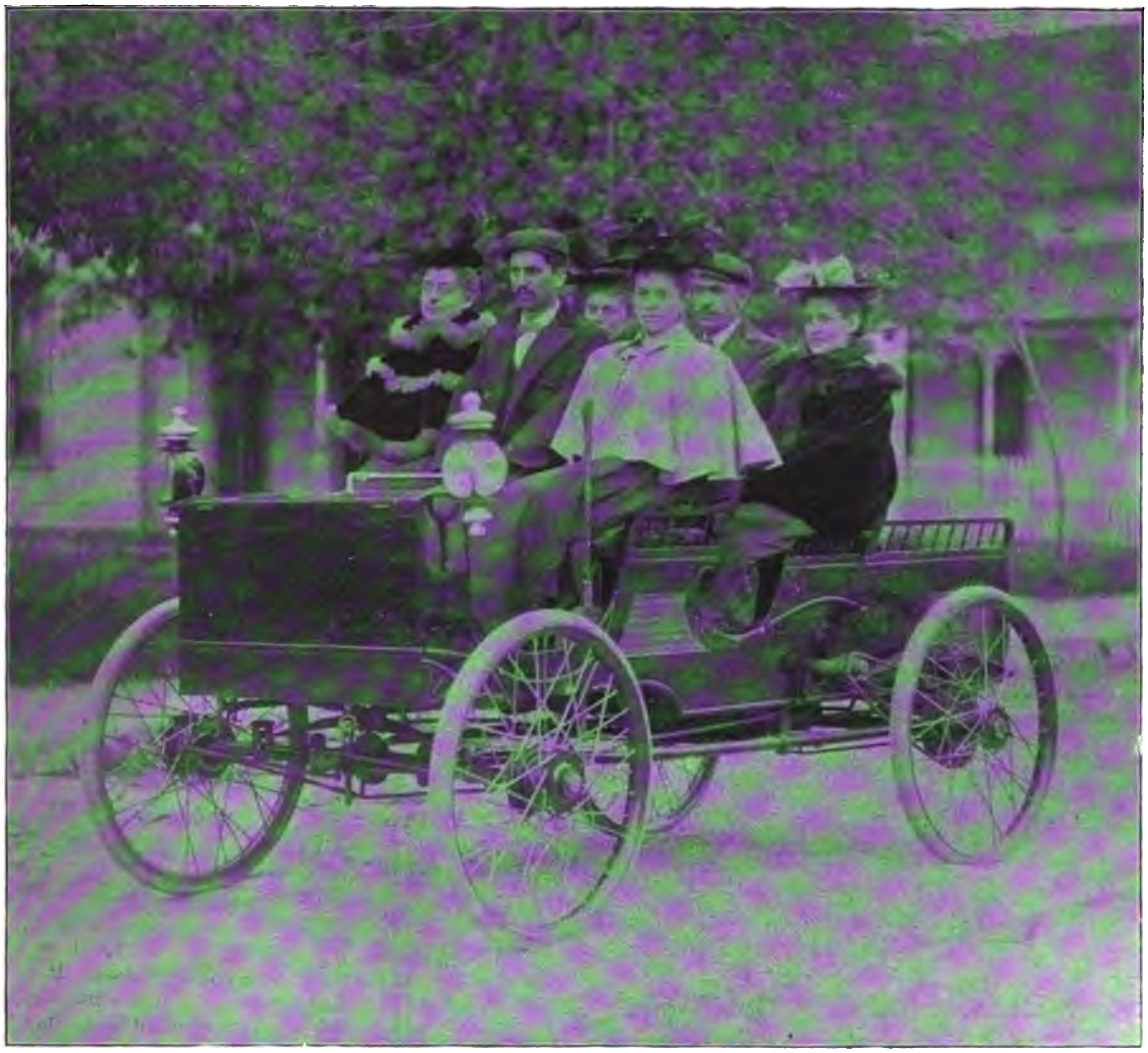
Haynes & Apperson state that they have met with good success in the use of aluminum alloys in the construction of these motors, as their lightness and strength, together with the readiness with which they may be cast, make them an excellent substitute for cast iron, which latter is not used in their motors except for the balance wheel and a few minor parts which are required to resist the heat. The aluminum alloy will readily resist a tensile strain six times as great as can be withstood by the same weight of cast iron in the same form of construction. They have had motors made of aluminum alloys in use for more than a year, and have never had any of the aluminum parts fail or show the slightest sign of weakness.

Their latest carriage, here shown, carries six passengers, and is fitted with 2½-inch pneumatic tires. Its speed has not yet been fully tested, but the builders believe it should run at least 20 miles per hour on a good level roadway. It is fitted with an 8-hp motor which makes 500 revolutions per minute and weighs 340 pounds, including balance wheel.

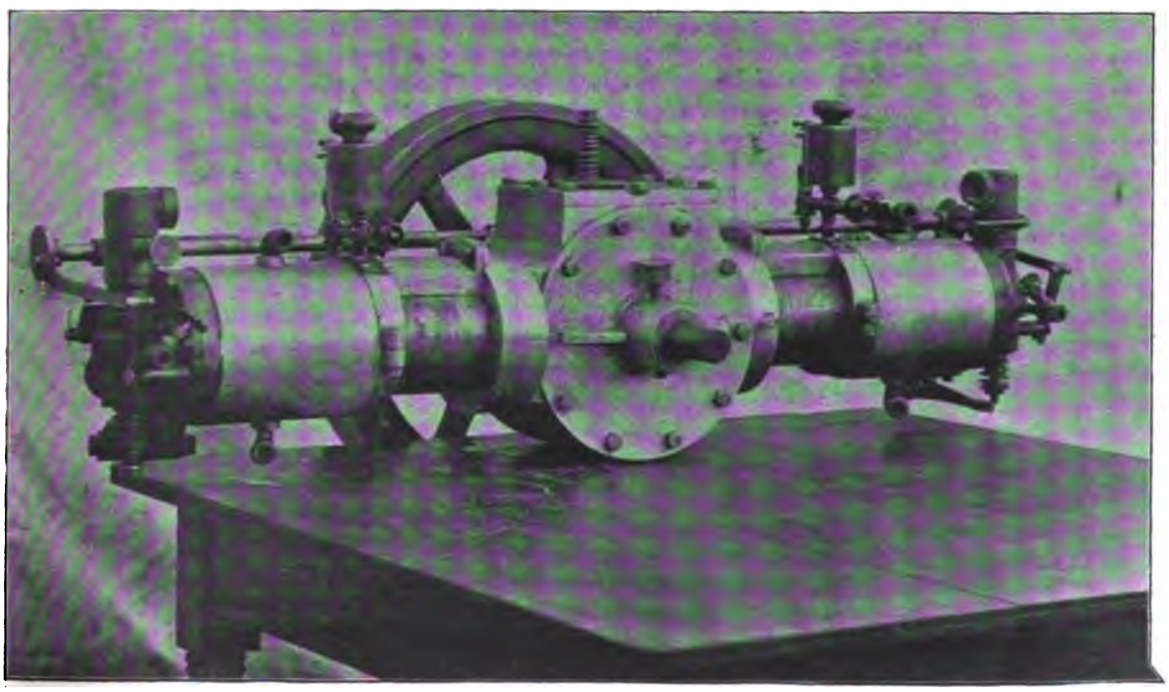
Power is transmitted through friction clutches to a countershaft, and thence by sprocket chains to the rear wheels. The main countershaft is supplied with a differential gear which permits the rear wheels of the carriage to accommodate themselves to the roadway. This carriage has four speeds of 4, 8, 12 and 18 miles per hour, and weighs without passengers about 1,500 pounds.

Haynes & Apperson are in favor of a good full-weight motor. They are aware that motors could be built considerably lighter than they build them ; but they question the wisdom of building them too light, as the factor of safety for a gasolene motor should be much higher than for a steam engine, and a considerable amount of the weight should be placed in the fly-wheel, so that the motor will run more steadily when out of gear and will start the carriage more readily when thrown into gear, owing to the energy stored in the fly-wheel. Moreover, the fly-wheel momentum is of great assistance in keeping a uniform speed in the carriage in traversing undulating roadways, which are frequently found in rural districts.

In order that the balance may be effectively and safely used they advocate a very strong crank-shaft, to withstand all the shocks and jars communicated from the momentum of the carriage as well as the force of the sudden explosions of the gaseous mixture in the cylinder. In short, Mr. Haynes thinks the entire motor should be constructed for durability and reliability, qualities far more important than high speed.



HAYNES & APPERSON'S LATEST MODEL.



8 HORSE-POWER CARRIAGE MOTOR. HAYNES & APPERSON, KOKOMO, IND.

CORRESPONDENCE.

We append opinions from a number of manufacturers and students of the motor problem in regard to the progress made in this country the past year in the new industry:—

From the Duryea Company's President.

SPRINGFIELD, MASS., Nov. 5, 1896.

Editor HORSELESS AGE :

Dear Sir :—You ask me what is my opinion as to the progress of the motor wagon art in America the past year.

I can only write with certainty concerning our own progress. It has been a year of experiment on details and an accumulation of the usual "valuable experience." We have a carriage now that we can put out with a feeling that it will stand the hard work demanded of it. Rather than cut the weight materially we have strengthened such parts as have shown signs of weakness. So we work along toward the "fool proof" stage that we are aiming at.

I believe that the uncertain state of the money market has temporarily cooled the enthusiasm of many who have been interested in the manufacture or purchase of horseless carriages in this country, but abroad the interest is growing fast, if the number of requests for agencies that we receive is an indication.

Very truly yours,

DURYEA MOTOR WAGON COMPANY,
Per George Henry Hewitt, President.

Studebaker Bros. Studying the Situation Closely.

SOUTH BEND, Oct. 19, 1896.

Editor Horseless Age.

DEAR SIR:—Yours 16th inst. to this company, respecting progress made during the past year in the motor-wagon line, has been referred to me. If you refer to the progress made by this company we are not yet prepared to give to the public what we have accomplished. However, we anticipate within a very short time to be able to present what we consider, from the standpoint of utility, a practical motor wagon. That there has been progress made during the past year is undeniable, and it is encouraging to note how extensively the field of investigation and experiment is being covered by your valuable paper and other publications with which we keep in touch with the developments, and while, as above stated, they have been very extensive, still from the standpoint of a practical, generally useful vehicle, it seems to us that they are still in the experimental stage.

Our Mr. P. E. Studebaker, second vice-president, and also J. M. Studebaker, first vice-president, have both been in England this Summer and made careful investigation of the field over there. They report the interest taken by the public as being very general, and that large amounts of capital are being invested in the erection of manufacturing plants and otherwise used for the purpose of developing the horseless vehicle.

Very truly yours, FRED'K S. FISH, *Counsel.*

Thinks We Are Mechanically Ahead of Europe.

PAWT.CKET, R. I., Nov. 16, 1896.

Editor Horseless Age:

DEAR SIR:—In reply to your inquiry, I think there has been little visible progress in the motor vehicle either here or abroad the past year, but there are probably many who have gained valuable experience, the beneficial results of which will appear later.

The announcement of the *Times-Herald* race called out a small army of cranks of the perpetual motion, spring motor, primary battery, etc., class. Most of their inventions (?) have already died a natural death, though occasionally a new one pops up. Of the other class, many of whom were mechanical or electrical engineers, the majority were only theoretically acquainted with the gas engine. A gas engine on paper is a very simple piece of mechanism; practically it is the reverse. Some of these engineers have designed and built engines which have never left the shop, as their owners did not care to risk their reputation on them, preferring to reconstruct entirely. Others have placed their carriages on the street with more or less success, at least having the satisfaction of seeing them go, even if they do not fully answer expectations. In some cases this creates a prejudice against the horseless carriage that may in future be hard to overcome. Take, for instance, the law passed by the authorities of Greenwich, Conn., prohibiting motor carriages on any of the streets. As this city is right on the main highway along the Long Island Sound, it is not very convenient to avoid, and it seems to me that it would be well for the American Motor League to look into the constitutionality of the law.

Many are now building their second, third or fourth carriages with the result that some will succeed. It is the same old story with all new inventions. There were many men and many minds working on the incandescent lamp filament before Edison, Maxim, Sawyer and Weston finally perfected it, and in the early trolley cars the burned-out armatures and commutators were enough to discourage Job.

I think we are fully abreast, if not ahead, of the foreign manufacturers in all the points that go to make a practical carriage; that is, ease of control, which is the most important feature, and then simplicity, economy of operation, cleanliness, neatness of design, and a fair rate of speed, either in gasolene or electric. Their tires are also inferior to ours, and I doubt if there is one vehicle among them that would be practical in this country.

A year ago the gasolene carriages were all the rage among inventors, but the electric seems to me to be gaining in favor now. Their ease of control, elastic power and cleanliness are beginning to be appreciated.

It is quite amusing to see the toll-men at the ferries, bridges, toll-roads, etc. They are at a loss to know what to charge, as their instructions are to charge according to the number of horses. The first time I crossed the Brooklyn Bridge I was charged 5 cents. At the other end, when I was returning, the ticket seller had a 10-cent ticket in his hand, but as soon as he saw I had a nickel ready he quickly changed it for a 5-cent one. The next time I was charged 10 cents at the first end, and on returning, ticket man number two asked me what they charged at the other end. I naturally gave him the lowest figure; after that 5 cents was all right at that end while it was always 10 at the other.

HARRY E. DEY.

Believe the Industry is Fairly Launched.

PHILADELPHIA, Nov. 23, 1896.

Editor Horseless Age.

DEAR SIR:—Replying to your favor of the 17th, as to our opinion on the progress made in the new art of motor vehicles during the past year in the United States, we would say that so far as the public is concerned there apparently has been no progress made, as there is no more evidence at the present time of the introduction of motor vehicles than there was one year ago. But, on the other hand, during the past year there has been a great activity among the inventors and promoters of the new art in organizing companies for the introduction of motor vehicles and the manufacture and sale of same, which will undoubtedly show results of importance the coming year.

We feel fully justified in saying, from what we have done and are now doing, that the enterprise has been fairly launched, and with a little patience and consideration on the part of the public for the shortcomings and defects incident to any new enterprise, and especially to such a revolutionary one as we hope this will be, that the great difficulties which we must expect to encounter before a complete commercial success will be obtained will disappear very rapidly when their introduction is made on a sufficient scale to give us the practical experience which apparently is all that is necessary to insure a complete triumph of the motor vehicle over horses. The names of the men behind the enterprise are alone sufficient to assure the public that no ordinary difficulties will be allowed to stand in the way of complete success. Yours very truly,

ELECTRIC CARRIAGE & WAGON CO.
by Morris & Salom.

A Year of Preparation.

NEW YORK, Nov. 15, 1896.

Editor Horseless Age.

DEAR SIR:—With this month the first year of motor vehicle history in this country closes.

True, previous to this period a number of experimental vehicles had been built, but they, in common with similar attempts since before the days of the locomotive, had proven failures, had attracted very little attention and had finally been abandoned, resulting in loss of interest in and hope for the future solution of the motor vehicle problem.

There were some exceptions made by inventors, who, determined to succeed, had kept steadily at the problem for years and had produced results which, however, were regarded as experimental, and were not appreciated by a skeptical public.

Motor vehicles are not yet in common use, but much has been accomplished. It has been proven that the most crowded city is traversable, and that deep frozen snow, although a hindrance, is not so serious a bar to the motor vehicle as to horses.

That a vehicle built for and used on the common hilly roads of New England should be able to do better than 25 miles per hour on the track without a change of gear is truly wonderful. The gasolene engine is considered inelastic, but the ability to run more than 50 per cent. faster than an already high normal speed indicates a very creditable elasticity.

Much experience has been gained. The work of several hundred inventors has not been wasted. It has helped to prepare the shops and mechanics of the land for the new industry. That we do not see their work is only because they have not yet caught up to the leaders, and so have nothing deserving public attention. CHARLES E. DURYEA.

Yucatan Wants Motor Cars.

MERIDA, YUCATAN, Nov. 2, 1896.

Editor HORSELESS AGE.

Dear Sir:—There is a field open here for gasolene or kerosene motors for street cars and light railway traffic. Electricity as a motive power cannot be introduced into this State yet, on account of local difficulties, and the same is the case with cable traction. Steam cannot be employed economically on account of the high price of coal—from $16 to $20 a ton. For these reasons animal traction is the only one available here for the city and suburban tramway lines, and my opinion is that a gasolene or kerosene motor would be just the thing for substituting horses, which, by the way, cost about twice as much to feed here as they do in the States. The same thing happens with the innumerable light railway lines throughout the State. These lines are generally owned by the hemp growers or "haciendados," who use them for the purpose of carrying the hemp leaves from the fields to the cleaning machines and packing houses. The gauge of these lines is generally 19 and 24 inches and the small cars loaded with leaves are drawn by mules. One or two progressive farmers have tried small steam locomotives, but have had to abandon them because they were found to be too expensive to run on account of the scarcity of fuel. Again, a gasolene or kerosene motor would be the proper thing for operating these lines, and I feel confident that a good motor car, capable of drawing, say five or six small freight cars, would find a ready market here. One mule draws one of these freight cars with a full load of hemp leaves.

I think the above statements will interest American manufacturers. I am the general manager of the company operating all the tramway lines of this city. For the last two or three years I have been studying the question of motive power for our cars, and now I have arrived at the conclusion that gasolene or kerosene motors are our only hope for the present, electricity, cable and steam being out of the question. Yours very truly, N. ESCALANTE Y PEÓN.

Sir David Salomons Addresses the Self-Propelled Traffic Association.

In an address recently delivered before the Liverpool branch of the Self-Propelled Traffic Association, Sir David Salomons approves of the new act of Parliament referring all specific regulations affecting motor vehicles to the Local Government Board, and reaffirms his faith in the steam vehicle of M. Serpollet as "the coming one," because of its simplicity and the fact that steam is now understood everywhere. The reason why a greater horse-power is required to propel a motor vehicle than is necessary when a horse draws the vehicle, he says lies in the fact that the motive power in the latter case is placed before the load, so that the wheels are lifted over obstructions, while in the former case the tendency is to push the wheels into the ground when an obstruction is encountered. In theory, to obtain double the speed, four times the power is necessary, yet with the motor-propelled carriage, within the limits of the speed permitted on the highway, the increase of power for a given increase of speed is almost an arithmetical instead of in a geometrical proportion. In other words, to obtain double the speed, instead of four times the power, very little over twice is needed.

No More Red Flags.

COLOSSAL DEMONSTRATION CELEBRATING MOTOR VEHICLE DAY IN LONDON.

Seldom has London witnessed such a turnout as gathered, on the 14th, around the Hotel Metropole and all the environs thereabout, to do honor to the motor vehicle, on that day relieved from the bondage of an obnoxious and obsolete law. Even the Lord Mayor's Show, which is regarded as high carnival in London, and generally draws the biggest crowds of sightseers, sank into significance in comparison with it.

Exulting in their new-found liberty and too impatient to wait for the full dawn, several of the owners of motor carriages spent the wee sma' hours of the morning in trial runs through the streets, just to see how it felt to guide a motor through the streets of the big city without fear of interference from the law.

Shortly before 9 o'clock nearly 50 motor vehicles of different styles congregated near the headquarters of the Motor Club in Northumberland Avenue, and were immediately surrounded by a curious crowd, which grew so suddenly that soon ordinary traffic was out of the question.

Previous to starting a breakfast had been arranged, in which many notables participated. Mr. Lawson, president of the club, then gave some practical advice to the operators of the carriages, cautioning them to use care in the management of their vehicles on this their first public appearance in England, and then seizing a red flag, such as the law required to be used previous to the new act, he tore it in shreds and gave the signal for the start.

Among those who had vehicles in line were the Great Horseless Carriage Company, the Anglo-French Motor Carriage Company, the Britannia Company, the Duryea Motor Wagon Company and Wm. Arnold & Sons. Mr. Pennington brought out one of his four-seated tricycles and ran it about before the start, but did not come up in time to get in line, claiming that the crowd was too dense. He joined the excursionists further out on the journey and kept the pace for a time, but was finally compelled to withdraw because of a bursted pneumatic.

The electric carriage went no further than Brixton, as their batteries were insufficient for a long run.

The day was cold and misty with promise of rain, which came before the party reached Brighton. It was a little after half past 10 when Mr. Lawson moved off with his pilot carriage, a phaeton of Panhard & Levassor, ornamented with flowers and banners. After this came the "Present Times" landau, which had already appeared in the Lord Mayor's Show; No. 6, of Panhard & Levassor, winner of the Paris-Marseilles race; the private carriage of the Hon. Evelyn Ellis, of the Daimler Motor Co., Ltd.; dog carts, delivery wagons in festal array, and a number of motor cycles imported from France. Several electric carriages closed up the rear of the procession, which was followed by a multitude of cyclists, the early part of the journey being frequently blocked by the throngs of spectators.

At Reigate, about half way, a halt was made for refreshments and supplies for the machines. The roads most of the way were heavy, and the limit of speed fixed by the new law being 12 miles an hour, no very sensational time was expected, but most of the carriages raced when fairly out of the city.

From Reigate the Bolleé tricycles pushed on rapidly, reaching Brighton through the falling rain before 3 o'clock. The Duryea wagon came in at 20 minutes to 4, and the pilot-carriage of the president shortly before five. Closely following the latter came a number of Daimler carriages and omnibuses. Quite a number failed to complete the distance because of accident, and others preferred to turn back to the city, when they discovered that a storm was imminent.

By a quarter to six, fifteen vehicles had arrived at the Hote Metropole, Brighton. The first to arrive was the Bollée tricycle, driven by the inventor himself, which is said to have covered the distance from Brixton, 48 miles, in 2 hours 53 minutes. By 9 o'clock all who had set out to reach the destinotion had done so, numbering 22 out of 35. Of the vehicles of the British Motor Syndicate all arrived before the banquet, at which the officials of the Motor Car Club, the mayor of Brighton and many invited guests were present.

On Sunday a public exhibition of the vehicles was given on the sea road and on Monday a procession was held which was witnessed by the entire population of Brighton.

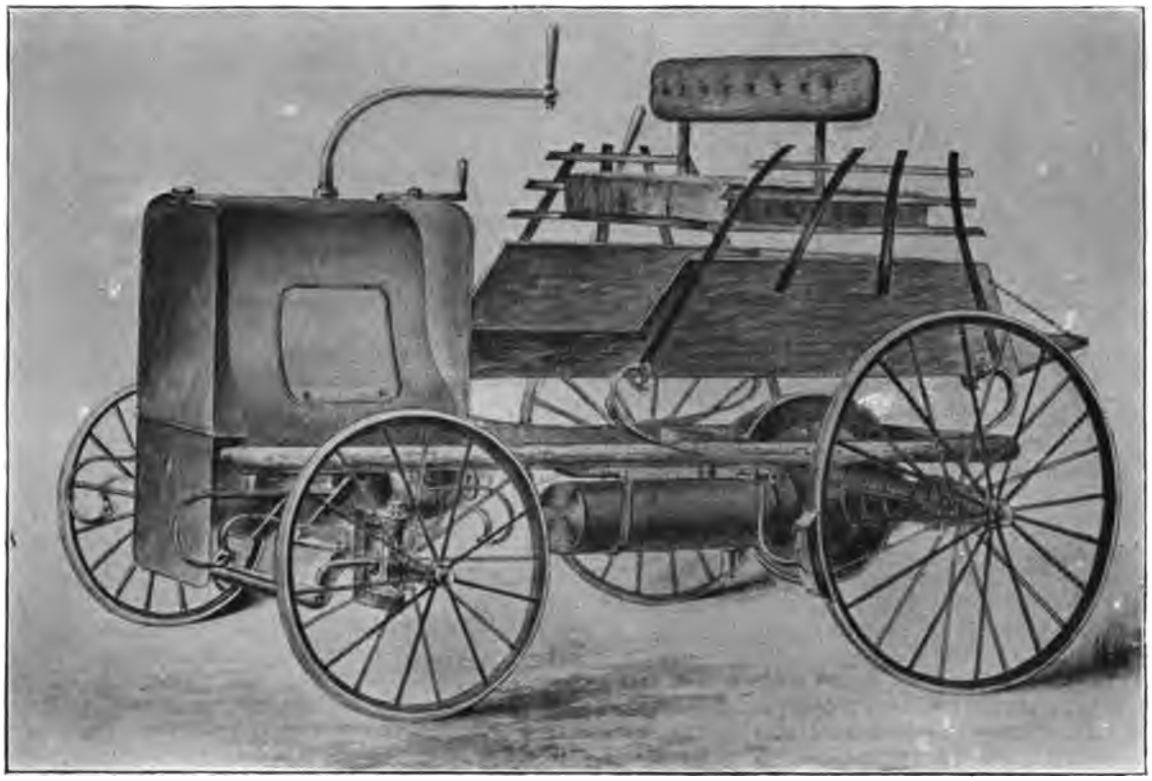
On Tuesday the majority of the carriages returned to London, the winners of the Paris-Marseilles race making extraordinarily fast time.

Among the distinguished visitors was Gottlieb Daimler, inventor of the Daimler motor, who rode down to Brighton in a carriage of his own invention.

First Daimler Carriage Built in England.

We reproduce from the *Autocar* a picture of the first Daimler carriage built in Fngland. It is rather an experimental machine than the finished commercial model, which, it is said, will closely follow Panhard & Levassor's most recent design. It is described as follows: "A deep U-shaped frame of angle iron forms the backbone, around which everything is built. in front of this is fitted the motor, a four horse-power, inclosed in a metal dome-shaped case, carrying the cooling water tank in front. This is placed immediately over the steering wheels, which are actuated by the lever handle shown in front, the two wheels working on jointed bearings giving differential steering. The driving wheels are placed at the other end of the frame, connected together by a compound shaft embodying a differential or balance gear by which they are both driven simultaneously, and yet automatically allowed to rotate at different speeds when turning. The driving shaft runs through a large box which entirely encloses the driving gear. This is a new invention of the Daimler Co, and may be broadly described as a modification of the Crypto dynamic principle, giving four speeds forward and one backward, and having the different wheels always in gear with each other. This gearing is connected with the motor by a strong shaft running down the centre of the machine. The oil tank is hung below the frame, as shown in the sketch, and the carriage body, which is of the four-seated dogcart type, is light and carried entirely upon the upturned ends of two triple-leaved springs, being entirely separated from the engine and frame upon which it rests, thus reducing vibration to a minimum: a second handle immediately in front of the driver serves to regulate the different speeds, and a powerful lever at the side applies the brake."

On the same page will also be found an illustration of one of Mr. Pennington's latest ideas—a fighting motor car driven by a 16-hp motor and carrying two machine guns and four men with 5,000 rounds of ammunition.



FIRST ENGLISH-BUILT DAIMLER CARRIAGE.

FIGHTING MOTOR CAR.—E. J. PENNINGTON.

To Race or Not to Race? the Question in France.

The discussion of the race question (not anthropological, but auto-mobile) has waxed hot in France. The leading scientific papers have devoted a great deal of their space of late to the testimony of experts and "chauffeurs" in regard to the desirability of holding further speed contests, such as the Paris-Marseilles-Paris race, recently conducted. M. Pierron, vice-president of the Touring Club of France, has published a letter, in which he deprecates any more such contests on the ground that they will endanger life and limb, and consequently when the fatal accidents happen, as happen they must, the authorities will impose restrictions on the use of motor vehicles and the public will become prejudiced against them. He regards the speeds of the last race as excessive.

Another correspondent of the *Touring Club Review* takes exception to M. Pierron, and holds that annual races are necessary to enable new manufacturers to test their theories.

As the subject is one of surpassing interest, officers of the Automobile Club decided to ascertain the attitude of the directors and prominent members of the club as to the need of future races.

The Count de Dion spoke most emphatically in their favor, holding that the industry is still experimental, and inventors and manufacturers are dependent upon race contests for a thorough test of their vehicles. The desired end of simplicity, durability, lightness and power he believes will be better obtained by races than in any other way, as competition or rivalry is the life of invention as of trade.

M. Berlier, another prominent member, looks upon races as a necessary stimulant to the inventor and manufacturer. He favors two contests for next June; one a pure speed contest of about 200 miles, open to all comers, and preceded by preliminary trials to determine those eligible; and a second competition for heavy vehicles, delivery wagons, vans, etc., in which other practical points would be taken into consideration.

These contests, together with an exhibition advertised far in advance, would in M. Berlier's opinion be the most satisfactory method of promotion. As regards a legal limit of speed he is opposed to it, believing that this should be left to the discretion of the operator, existing laws being sufficient to cover all cases of recklessness in the management of a motor vehicle.

M. Géorges Berger, honorary president of the Automobile Club, and deputy of Paris, is of the opinion that the durability and power of petroleum vehicle motors has been fully established by the Paris-Marseilles race. He realizes the need of variable power and variable speed, but rather deprecates such *tours de force* as the last race, unless the forced conditions are clearly understood and the normal conditions of practical use are held ever in view.

M. Levassor, one of the pioneers of the art in France, feels his position as the winner of two successive races, and is somewhat loth to express himself. If he is in favor of another race, it will be ascribed to selfish motives, and if he is not in favor of another, it will be said that he is afraid to try his fortune again. He therefore prefers to abide by the decision of the majority. If a race is organized, he will compete. If an exhibition, he will exhibit. All he wants is sufficient notice of the programme.

M. Jeantaud, the prominent carriage builder of Paris, believes in races, but thinks one or two competitions or exhibitions should be held annually.

M. Collin, engineer and one of the officials of the Paris-Marseilles race, is quite emphatic in his approval of the race. He believes it is the duty of the Automobile Club to organize one every year for some time to come, supplementing it with a competition similar to that of the *Petit Journal*, in 1894, when practical points were chiefly considered. He would not prohibit high speed, but leave the matter to the judgment of the operator. The increased speed of 1896, he says, was made on the levels and in hill climbing, several of the carriages that competed in 1894 having coasted as fast as those of 1896.

M. Leon Bolleé, the popular constructor of the Bolleé tricycle, frankly confesses his disbelief in the race, and fortifies his position with many reasons. A course like that of Paris-Marseilles, in his opinion, introduces conditions which are altogether forced and different from those met in practice, and fosters in the public mind the notion that the art of horseless locomotion is in a far more embryonic state than it really is. The effect of the Paris-Marseilles race upon the English public he describes as unfortunate, because the delusions were now prevalent there that a petroleum carriage cannot run over a dog without upsetting; that a steam vehicle cannot go a hundred miles continuously; that pneumatic tires crush even under the weight of a voiturette, etc., whereas in practice, at normal speeds, none of these things would happen.

Races produce monstrosities. No railroad locomotive goes 120 miles without stopping, and no person really cares to undertake so long a journey on the common road. The consequence is that the designer of a racing machine has to use a very heavy motor, capacious supply reservoirs, complicated lubricators; in short, to abandon entirely the commercial type for another which has no place outside of a race. He himself did not care to enter the ordinary voiturette he is building for the market, because it is limited to 15 miles an hour and carries supplies of oil and petroleum for only about 80 miles. So he built a special racer, more complicated, less pleasing in appearance, harder to manage and more costly to run, but capable of making 24 miles an hour on a level and nearly 50 miles an hour on a long descent. He does not regard this racing voiturette as an improvement over his other model, but rather a retrogression.

Then, furthermore, M. Bolleé thinks chance plays altogether too large a part in a race. If, as is contended, the incompetent manufacturer is sure to be eliminated by the race, the competent stand little better show because of accidents or incidents trivial in ordinary practice, but fatal in a race.

The best means of perfecting a machine is to test it under the exact conditions of practice.

No tourist wants to continue on his way in the midst of a tempest, which is so severe as to put a stop to railway traffic.

Fortunately none of the operators were seriously injured during the Paris-Marseilles race, but serious or fatal injuries might have been sustained, with the result that the public would have looked with distrust upon the motor vehicle which maims or kills even its own inventors and manufacturers.

M. Bolleé, like others, feels bound to participate, however, should it be the wish of the majority to organize another race next year.

M. Serpollet, inventor of the steam vehicles of that name, professes himself a firm believer in races, with certain modifications. The last race, he believes, was fruitful of error because speed only was taken into account regardless of the

means employed to obtain it; *i. e.*, complicated machinery, difficult to keep in repair; numbers of vehicles entered by the same manufacturer, and the fact that little attention was paid to the best general average.

He favors a course from Paris to Boulogne and return, which could be covered in one whole day, an exhibition taking place at Boulogne the second day and the return on the third day.

Each manufacturer would be allowed to enter two vehicles in each series.

Speed would be given a certain number of points, but general average and freedom from delays *en route* would be equally important. To determine the latter point the vehicles should be "controled" every 15 or 20 miles, and the prize should be awarded to the vehicle which had accomplished the journey in the least time, and had also suffered the least detention from derangement of its machinery. The condition of the vehicles on their return to Paris should also to be taken into account, under the direction of a committee of the club, to determine the condition of the motors, transmission, axles, wheels and general structural work.

He does not regard races as dangerous, because those in charge of the vehicles are experienced and cool-headed men, who know perfectly well what is expected of them. The last two races prove this.

"I believe races have done much and will still do more for the cause of the motor vehicle," says the Count de Chasseloup-Laubat, a distinguished amateur and member of the Automobile Club. The race is the best possible test of the qualities of a motor vehicle. Exhibitions he regards as useful in determining more definitely the end to be attained and in determining the different kinds of vehicles that are adapted to the various purposes. But even in this case awards would be difficult to render and would probably satisfy nobody.

He believes in a long race, and asserts that accidents have been and are likely to be few. Only manufacturers, in his opinion, should be allowed to compete in the great races.

The speed question seems to him difficult of solution, and he recommends that a committee of the club take the subject under consideration.

The Baron Zuylen de Nyevelt, president of the Automobile Club, prefaces his opinion by a broad assertion that the races of this and last year have been a powerful aid to the new industry, but adds that he sees no reason for their continuance. The chief difficulty the industry now has to contend against is the lack of manufacturing facilities, as the few manufacturers are already taxed beyond their facilities, and now need a little relaxation from the race excitement to quietly perfect their models and equip their factories for the overwhelming demand.

The Baron argues for a competition of heavy vehicles, carrying 15 to 30 persons and making eight or nine miles an hour. Five names, he said, had already been inscribed in this class. A competition for electric cabs was also on the club's programme, the Baron announced, for the first time, but he did not think it wise to weary the public and the manufacturers by too many such formidable contests as the Paris-Marseilles.

M. Henri Menier, vice-president of the Automobile Club, said he was in favor of motors powerful enough to give high speeds, as they would make it possible to attain a high average speed on up-grades and levels without risking one's neck on the down-grades.

The race seems to him the only possible test of merit at the present time. A mere exhibition would cause more dissatisfaction.

M. Armand Peugeot, of the Peugeot Company, believes that the three races already run have convinced the most incredulous of the practicability of the motor carriage, and that their effect has been to stimulate the manufacture of motor carriages. While he is not opposed to further races, he suggests that new rules be adopted to govern them.

He recommends one continuous course of about 175 miles, or twice that distance, in two stages. Such a course could be covered between sunrise and nightfall. Amateurs as well as manufacturers should be allowed to compete, and the widest liberty should be permitted to contestants in the matter of supplies and repairs *en route*. They should simply be required to depart at a certain hour in the morning and to report at the controle on their return.

In the matter of consumption of fuel for work done, he thinks interesting data might be obtained.

The next race should not be held before 1898, in his opinion, because at least two years will be required to put into practical shape the new ideas gained from the Paris-Marseilles race. A race next June would probably bring to light nothing new. He does not see how speed can be successfully regulated, nor does he think it should be. The skill and judgment of the conductor must decide when high speed can safely be taken. In this matter prudence should be counselled among all amateurs and experts.

An ideal race course, in M. Delahaye's mind, is one not exceeding 30 miles in length, and offering varied conditions of road. Over this course the contestants would go back and forth under the strict surveillance of frequent controles and watched by an attentive public.

In regard to speed, he does not favor any limits, preferring to leave the matter to the judgment of the conductor.

M. Récopé, chairman of the Race Committee of the Automobile Club, thinks the last two races have amply demonstrated the success of mechanical traction. He does not approve of another race next year, rather advising exhibitions, where the different types of vehicles could be shown and stress laid upon simplicity, ease of control, absence of vibration and odor, cost and appearances.

High speeds are not required in vehicles intended for the public highways, nor are they safe.

A Horse Cycle.

President L. S. Woodbury, of the Great Falls Iron Works, Great Falls, Mon., has in contemplation the construction of what he chooses to term a horse cycle, whereby a horse can propel a four-wheeled vehicle on ordinary ground at the rate of one mile in 59 seconds. The proposed machine can be made in two forms, either one of which Mr. Woodbury thinks will fill the bill.

The first is in the form of an ordinary buggy. Instead of being hitched ahead the horse will occupy a position between the four wheels and operate a sort of treadmill. Should the velocity be so great as to attract too much air, then it is proposed to inclose the entire machine—horse, rider and all—in a whaleback or torpedo-cut shell, the propelling operation to remain the same. The seat of the rider will be directly behind or above the horse.

Motors were recently used at Coventry, England, to bring votors to the polls during the municipal election.

An Enormous Tractor for Western Australia.

The editor of The Horseless Age has been in receipt of many inquiries from tropical or sparsely settled countries for motor vehicles or tractors for transporting merchandise over common roads. Up to the present time it has not been possible to record a successful attempt to build such a vehicle in this country, but a Western company has finally taken the initiative—the Best Gasolene & Crude Oil Engine Works, of San Leandro, Cal.—and constructed for use in the mining regions of Western Australia a tractor or motor wagon equipped with power sufficient to haul other wagons, which will probably serve as an incentive to other manufacturers to build similar machines. This tractor, which is furnished with a 75-hp motor, is intended for service at the Coolgardie mines, 400 miles in the interior, in hauling merchandise from the coast. The power developed is supposed to be sufficient to draw two wagons loaded with 120,000 pounds of freight at a speed of four or eight miles an hour across a desert land.

The owners of the mines puzzled long over the problem of transportation facilities. Their properties were valuable, and the large numbers of men engaged there necessitated the purchase and transportation of supplies of provisions, clothing, etc., in addition to the machinery and miscellaneous material required in a large mining settlement. A railroad was out of the question, as the cost of it would be too great for the individual needs of the miners, and the whole country traversed by it would be a desert. Consequently the owners of the mine decided that a motor road vehicle was the only practical solution of the difficulty, and after some investigation gave the order to the above concern.

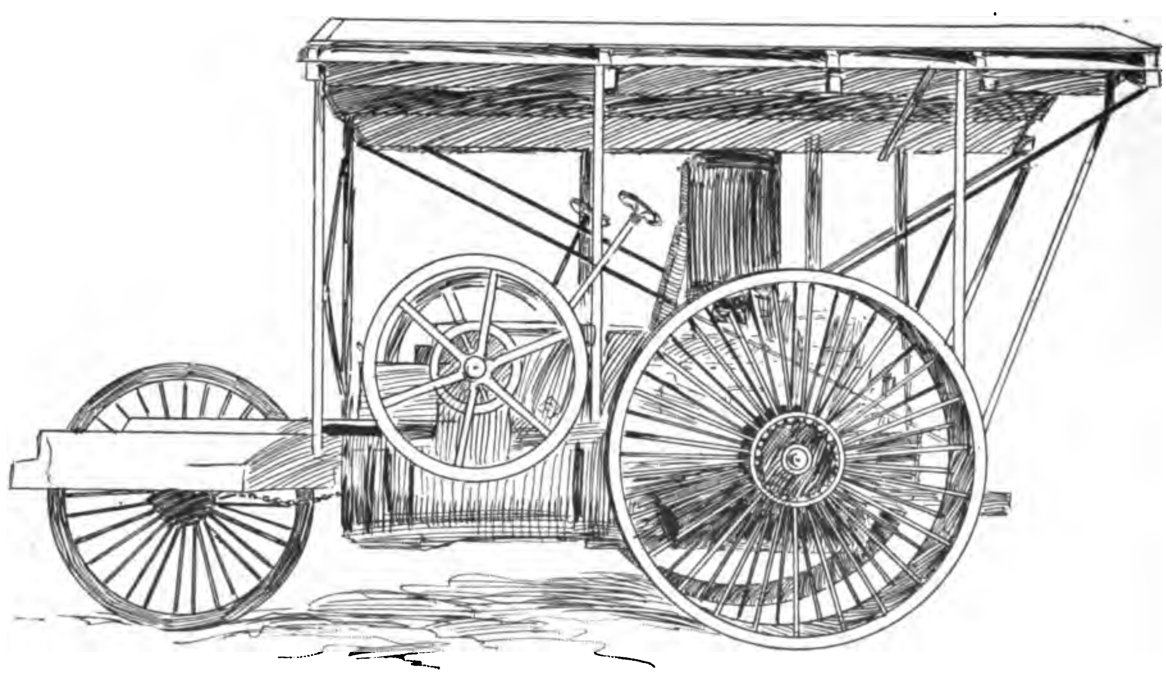
The fuel will be crude petroleum as described in the January issue of The Horseless Age, page 15.

One of the chief difficulties Mr. Best encountered in the designing of this vehicle was the water jacket for cooling the cylinders of the motor, as no water is to be had during almost the entire journey, but a satisfactory solution of the difficulty was found in the roof of the tractor, which is composed of 1,100 feet of water pipes, into which the water passes and returns again to the tank after being cooled. In this manner the original supply of water does duty over and over again, with small loss by radiation, and the cost of operation is reduced very materially.

Sufficient crude petroleum and water are taken along for the 400-mile run.

The main driving wheels are 8 feet in diameter and have tires 14 inches wide.

The motor has four cylinders, and speed is regulated by friction clutches.



CRUDE OIL TRACTOR.—BEST GASOLENE AND CRUDE OIL ENGINE WORKS, SAN LEANDRO, CALIFORNIA.

FOREIGN NOTES.

Motor vehicles are to be introduced in Auckland, New Zealand.

E. J. Pennington announces that he has taken up his permanent abode in England.

The identical No. 6, which won the Paris-Marseilles race, is now on exhibition in the window at No. 40 Holborn Viaduct, London, which is headquarters of the Motor Car Club.

One of the newcomers in the English field is the Steam Carriage and Wagon Company, of Chiswick, who are prepared to build steam vans to carry from one to two tons, under the Thornycroft patents.

An electric tandem bicycle has recently been experimented with in England for pace making. A storage battery is employed, and auxiliary pedals enable the riders to supplement the power of the motor.

Gautier & Wehrlé have just brought out a new petroleum motor carriage, which is described as rather "American" in style, and of extremely light construction, weighing only a little more than 500 pounds.

The London Electric Omnibus Company has put several 'buses in service between Liverpool Street and Hammersmith, and intends to increase the number gradually until 100 are running between various points in London.

As a sample of what some of the leading carriage builders of Paris are doing in our line we reproduce a model from the warerooms of N. Belalette, 24 de l'Avenue des Champs Elysees, which is much admired for its style and elegance.

The Automobile Club are now considering plans for the proposed race of heavy vehicles scheduled for next July. It is at present thought the limit of weight carried by each vehicle will be fixed at 10 persons or "places," each place being figured at 225 pounds, baggage included.

On Oct. 24 a run of motor vehicles was made from London to Brighton under the auspices of the Motor Car Club. The journey was undertaken with the consent of the necessary authorities, and its object was to give the officials who are preparing the new regulations governing motor traffic an object lesson in the control of the new vehicles.

The fourth annual Salon du Cycle, which opens at Paris, on December 12th, and continues until the 27th, will have a motor vehicle section much larger and more interesting than the show of last year. Among the new vehicles will be an electric one built by M. Jeautaud, the well-known carriage builder of Paris.

The annual Lord Mayor's Procession in London this month was rendered memorable by the appearance in it—for the first time—of a motor carriage piloted by "Sir" Harry J. Lawson, the "motor king" of London. As the stoppages in line were very frequent it was an excellent test of the control of the new vehicle, and thousands of spectators gave testimony of their appreciation *en route*.

It is proposed to put 300 electric cabs in operation in the streets of London as soon as they can be built. A company, called the London Electric Cab Company, has been organized under license from the British Motor Syndicate, to promote the enterprise, and offices have been opened at 6 Old Jewry, London, E. C. The leading spirits in the company figure a daily profit of over $1.50 per cab under the present renting system, making an annual profit of nearly $200,000.

Serpollet, the well-known French inventor of steam vehicles, is seeking new laurels by invading the field of light vehicles, which up to the present time has been almost wholly monopolized by the petroleum vehicles. He has just completed an experimental tricycle for two persons, which is said to be capable of a speed of 18 miles an hour. The boiler, of 10-horse capacity, is of an improved Serpollet pattern, and the weight of the vehicle is about 1,200 pounds. M. Serpollet states that he did not enter this vehicle in the Paris-Marseilles race because it was entirely experimental, and not adapted to so severe a test.

M. René Varennes is opposed to a repetition of such a course as the Paris-Marseilles. Any one who is not convinced by the one just run cannot be convinced. The limit of speed with safety, in his estimation, depends upon the weight of the vehicle. A motor carriage weighing less than a ton with its passengers, may safely attain a speed of 18 or 20 miles an hour, while a three-ton vehicle (load included), could scarcely exceed 8 or 9 miles an hour with safety. By this he states that he means the maximum speed allowed under the most favorable conditions. It is not speed itself that is dangerous, he says, but speed under dangerous conditions.

M. Michelin, inventor of the Michelin pneumatic tire, and a large manufacturer of the lighter sort of motor vehicles, called motor cycles, enlarges upon the poetic or scenic phase of the motor vehicle moving at high speed, and compares it with the view from the railroad train, where the close confinement, the tunnel, the station, etc., combine to the discomfort of the traveler. He does not believe high speeds are dangerous if the vehicle is properly built. Some motor vehicles he would not care to ride in at 12 miles an hour, others he would feel perfectly secure in at a mile a minute. To determine whether a vehicle is safe or not he knows of no better test than a race. The proposal to hold races on race tracks he deprecates, as he thinks the operator should have perfect freedom to choose his speed at his own risk.

Petroleum Tugs for the West Indies.

The Hamburg-American line has recently acquired two steel tugs, about 30 feet long, each furnished with a 10-hp petroleum motor, and capable of hauling a load of 300,000 pounds at a speed of over nine miles an hour. These tugs are to be stationed in the West Indies, and will be carried from one port to another by the steamers of the Hamburg-American line for the purpose of hauling lighters. The company is thus independent of any local deficiencies in the lighterage. The petroleum motors are of great advantage, as they are ready for starting upon short notice and require no boilers or coal bunkers.

Enoch Prouty, president of the Prouty Company, 334 Dearborn Street, Chicago, Ill., has recently taken out a series of patents on a system of propelling vehicles, which is the result of several years of study and experiment. These patents embrace a gasolene motor, which is said to emit no odor, to be extremely simple and to require very little water for cooling; a transmission device applicable to all classes of vehicles, and a muffler.

Recent Patents on Gas Engines, Motors, Etc.

570,500. *Gasolene or Vapor Engine;* Enoch Prouty, Chicago, Ill., assignor to Olive S. Prouty and Enoch Prouty, same place. Filed Nov. 1, 1895. Serial No. 567,600.

570,501. *Power Transmitter for Road Wagons;* Enoch Prouty, Chicago, Ill., assignor of one-half to Olive S. Prouty, same place. Filed April 27, 1806. Serial No. 589,286.

570,502. *Muffler for Engines;* Enoch Prouty, Chicago, Ill., assignor to Olive S. Prouty and Enoch Prouty, same place. Filed May 18, 1896. Serial No. 591,934.

570,613. *Boat Propelling Attachment*; Samuel M. Smith, Minneapolis, Minn. Filed Nov. 16, 1895. Serial No. 569,151.

570,649. *Gas Engine;* Rolf J. Rolfson, San Francisco, Cal., assignor of one half to Samuel S. Simrak and Albert R. Herman, same place. Filed May 16, 1895. Serial No. 594,522.

570,952. *Self-Propelling Vehicle;* Reuben H. Plass, Brooklyn, N. Y. Filed April 20, 1895. Serial No. 546,555.

571,147. *Combined Steam and Explosion Engine;* Walter Barnsdale, Plover, Wis. Filed May 11, 1895. Serial No. 548,968.

571,239. *Internal Combustion Engine:* Charles W. Pinkney, Smethwick, England, assignor to Taugyes, Ltd., Birmingham, England. Filed Feb. 24, 1896. Serial No. 580,454. Patented in England, Nov. 27, 1893. Serial No. 22,753.

571,206. *Device for Converting Motion;* Weston E. Watkins, Phelps, N. Y., assignor to William A. White, same place. Filed Jan. 28, 1896. Serial No. 577,168.

571,326. *Traction Engine;* Ransom S. Angell, Oakes, N. D. Filed June 20, 1896. Serial No. 596,281.

571,392. *Self-Propelling Vehicle*; Reuben H. Plass, Brooklyn, N. Y. Filed April 20, 1895. Serial No. 546,559.

571,447. *Gas Engine;* Charles A. Kunzel, Jr., Hoboken, N. J. Filed Dec. 10, 1895. Serial No. 571,686.

571,448. *Gas Engine Governor;* John W. Lambert, Anderson, Ind., assignor to the Buckeye Manufacturing Company, same place. Filed March 5, 1896. Serial No. 581,960.

571,495. *Gas Engine;* Fred C. Olin, Buffalo, N. Y. Filed Oct. 2, 1895. Serial No. 564,410.

571,498. *Gas Engine;* Emil Rappe, Chicago, Ill., assignor to Harvey J. Hopkins, Pleasantville, Pa. Filed Jan. 29, 1894. Serial No. 498,355.

571,534. *Gas Engine;* Geo. W. Lewis, Chicago, Ill. Filed Aug. 4, 1893. Serial No. 482,343.

571,679. *Device for Converting Motion;* Van Rensselaer McCullough and Morgan McCullough, Vernonia, Ore.; said Van Rensselaer McCullough assignor to said Morgan McCullough, and said Morgan McCullough assignor of one half to Timothy J. Hoare, Miltnomah Company, Oregon. Filed June 18 1894. Renewed April 30, 1896. Serial No. 589,788.

571,860. *Vapor Burner.* Henry A. House, Bridgeport, Conn. Filed Feb. 26, 1895. Serial No. 539,760.

571,879. *Variable Speed Countershaft.* Britain Holmes, Buffalo, N. Y., assignor to James Sangster, same place. Filed May 20, 1895. Serial No. 549,882.

571,966. *Operation of Gas Engines.* Mildred Blakey, Pittsburg, Pa. Filed March 18, 1896. Serial No. 583,718.

572,036. *Wheel with Electrical Motor-Hub for Vehicles.* Charles Theryc, Marseilles, France. Filed July 31, 1896. Serial No. 601,271. Patented in France Jan. 30, 1896. No. 253,580.

572,051. *Motor Vehicle.* James F. Duryea, Springfield, Mass., assignor to the Duryea Motor Wagon Company, same place. Filed March 6, 1896. Serial No. 582,102.

SPECIAL NOTICES.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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The "Noise" Question.

ADVOCATES of a perfectly noiseless motor carriage should look about them and study other types of road and track vehicles.

Noise is inseparable from locomotion, and the higher the speed, as a rule, the greater the noise. The trolley is second only to the locomotive in the noise it makes in motion. This noise, a buzzing or whirring sound due to the rotary action of its motor, can be heard a long distance, and in spite of the complaints of the nervous and the invalid, is not an unmixed evil. The trolley is built for relatively high speed in public streets, and the further its danger signals can be heard the greater the speed it can with safety attain. The trolley virtually has two danger signals, the gong and the whirr of the motor. The gong is an emergency signal, used when an obstacle is seen immediately in its path, and the person hearing it knows at once the kind of vehicle that is approaching, for all have come to associate the gong with the trolley. Hence, through force of habit, one sense helps the other. If the eyes are averted, as often happens, the ear "sees" the approaching car, and the will is enabled to act quicker than it otherwise would, and carry us out of danger. The use of this peculiar signal, therefore, saves time in critical moments, and in street traffic time means life and limb. But the whirr of the trolley, ascending in the scale as the speed increases, is even more characteristic of that vehicle than the gong, for the latter warning is also in use on ambulances and fire apparatus, while the hum of the motor is all its own, and but for it the gong would have to be rung more frequently than it is.

The necessity of similar warning disappears in the horse vehicle for the reason that the horse announces his coming with his hoofs, and the animal himself has some skill in avoiding danger, but carriages propelled by power within, especially when equipped with rubber tires, are required to use signals to warn pedestrians of their approach. If this precaution is demanded by law in the case of the horseless carriage and not in the case of the horse carriage, the advantage as regards noise surely seems to lie with the carriage that goes without horses. What the authorities complain of, evidently, is that the new vehicle is *too* noiseless, while some of the literary critics of the new vehicle find it too noisy. The explanation of this inconsistency is not far to seek. From their point of view the civil authorities are right. The motor carriage in its present stage of development makes less noise *in motion* than a horse carriage. At rest,

of course, the advantage is with the horse, but on the road the animal sends his warning message further than the motor. On this account, and because the motor carriage is new and the public are unaccustomed to it, the authorities very properly demand a danger signal to guard against accidents. As to the critics who find the new vehicle too noisy, their perception of kind in noises is much keener than their perception of degree. The noise of the motor is new, and the noise of the horse is old.

But is it desirable that the motor carriage should be noiseless in its operation (the term noiseless is used comparatively)? We have contended that the characteristic whirring sound of the trolley is not without its public benefit. May it not also be true that public benefit will result from the peculiar sound which the machinery of the motor carriage will produce when in motion? Will it not also become familiar, and, being heard at some distance, render the use of an emergency signal less frequent? The machinery of the motor carriage will not make so noticeable a noise as that of the trolley, because the power generated is much less.

The bicycle is the most noiseless of all vehicles. Constant complaints are made against it on this ground, and for this reason no vehicle is compelled to use its emergency signal—the bell—so frequently.

The motor carriage cannot compare with the bicycle in noiselessness, but if it must be provided with an emergency signal, the question arises—what signal shall be chosen? If the gong is adopted the motor carriage will be confounded with the trolley; if the bell, it will be confounded with the bicycle, and accidents will result which might have been prevented if a distinctive signal had been used.

The tinkle of the bicycle bell is peculiar to that vehicle, and is familiar to all but the aged and infirm. On hearing it one is immediately aware of the proximity of a bicycle and takes precautions to avoid its path. A gong would be disproportionate to the size of the bicycle and would lead to confusion in the public mind. The ear would not be able to distinguish the bicycle from a trolley, and the eyes would have to supplement the ear, involving a loss of time. The same confusion would result if the gong or the bell were adopted for the motor carriage. Both signals are already preempted, and the motor must look further for its warning.

The whistle, which has been selected by a few motor inventors, is too suggestive of the locomotive and of steam in general. The only alternative, then, seems to be the horn, one form of which is now in use among the French manufacturers. The bicycle sizes have been imported into this country to some extent by dealers in sundries, and not long since they became the popular signal in Washington, D.C., but their tone was so little appreciated by the horses of the Capital that the city authorities forbade them entirely. In discarding the horn and the whistle in favor of the bell, the American bicycle rider has done wisely, for the bell is best suited to the wheel, even on grounds of sentiment. The whistle and the Paris horn are quite unsung in the anthology of the bicycle, while the bell is the source of inspiration for many a tuneful lyric.

The sound emitted by the Paris horn is not a musical one, but a danger signal should startle rather than please. The quality of the sound might easily be improved, and so, probably, might the quality of the rubber bulbs, which are said to crack under frequent pressure.

If the horn is not to be chosen as the danger signal of the motor carriage, what is? The question is of more importance than appears on the surface, and the editor would gladly receive opinions from readers.

Mr. Sennett's Plan of Manufacture.

Alf. R. Sennett, a well-known English engineer, who has devoted a good deal of attention to horseless road locomotion, gives his views on this subject in a letter to the editor of the London *Engineer* of Dec. 18. After pointing out that England was the birthplace of the motor vehicle, and that as early as 1831 steam stage coaches were running reglarly and satisfactorily between Cheltenham and Gloucester, he refers to the "railway mania," which, together with the opposition from the horse interests, exiled the motor vehicle from the shores of England for two generations.

In contrast with the enormous sums which the British public now appears to be paying for French patents, he cites an instance where the tables were turned at this early day, a French company having paid £16,000 for an English motor patent.

The French inventors, he believes, have confined their attention too closely to the pleasure carriage, which in its present form he finds lacking in the luxury which characterizes the productions of the

British carriage manufacturer. Nor does he see in the "motor car" a dangerous rival of the horse for private pleasure service. The delivery wagon and heavy merchandise truck he thinks the legitimate field of the new locomotion, and the motive power for this purpose, in his opinion, is steam. He says:

"There is, however, a side to the horseless road locomotion movement which should be fraught with the greatest advantage to our country, and that is the mechanical road transport of goods and the public conveyance of passengers. Occupying the first position in this relation, undoubtedly, is the adaptation of mechanical road transport to the exigencies of modern agriculture; then to passenger transport, by means of omnibuses, with the horse-drawn prototype of which our streets have now become so overcrowded; and lastly—but of vast importance—the delivery of all kinds of goods, not only by forwarding agents, but by all classes of our tradesmen. For such work, with the exception of the very lightest type of trade delivery cart, there can be no shadow of doubt that the most suitable motive power we possess to-day is steam, and after that, for urban service, electricity. In regard to these the engineers of this country certainly require no extraneous assistance, either from the Continent or elsewhere, and my great wish in craving space in your columns is to draw public attention to this fact. With regard to petroleum motors, undoubtedly there is a vast field in store for these so soon as they shall have sufficiently developed to become apposite for fulfilling the conditions required of them in this relation."

He then suggests a way in which he thinks this change in road traffic can be most speedily accomplished, and that is by the friendly co-operation of English engineers and carriage builders. He recommends that "neither carriage builders nor engineers shall construct self-propelling vehicles outright, for neither are fitted for such work, but that the vehicles should be designed in such a manner that the portions properly appertaining to each class of manufacturer should be kept distinct. This is quite a simple matter if the vehicles be designed on common-sense principles, namely, if the body be kept quite distinct from the underframe, as in the construction of railway coaches. This being done, there is nothing to prevent our engineers from making their underframes complete with their motors in large quantities, turned out to gauge and template, with the maximum of economy; while, on the other hand, our carriage builders would have nothing new to trouble themselves with, but would be kept busy in utilizing their great experience in the construction of bodies, comprising elegance, comfort and high quality of workmanship and finish."

Mr. Sennett closes his communication by presenting a plan for the formation of a motor vehicle company on lines very different from those that are being followed by other promoters in England to-day. Not a farthing should be paid to vendors or patentees in this novel enterprise, but every penny would be available for working capital, and the machinery of these vehicles would be built by existing British engineering firms, and the bodies by existing British coach builders. Such a grand coalition would, in Mr. Sennett's estimation, be productive of great benefit to both trades as well as to the consumer, who would be relieved of the tax of heavy royalties paid for foreign patents by overhasty investors.

We shall not comment on Mr. Sennett's views in regard to the comparative merits of the different motive powers now offered for the propulsion of vehicles, nor shall we discuss at length his opinion that the motor pleasure carriage has no future in England, because they breed such fine horses and have such magnificent equipages there. Mr. Sennett, in common with many others on both sides of the Atlantic, fails to comprehend the full scope of this new industrial movement. But the plan of manufacture which he outlines savors so strongly of a popular error that has already been responsible for many abortive results in motor vehicle building, that attention should be directed to it. We refer to the idea that the motor carriage is a piece of patchwork, composed of ready-made parts. We have carriages, we have motors, we have belts, chains and gears, *ergo* we have motor carriages; so reason thousands, and so, apparently, does Mr. Sennett. Among the unmechanical this error reaches the point of absurdity, where it is imagined that all one need do to make a motor carriage is to buy a motor and screw it onto any present type of carriage and bowl merrily away.

One of the chief reasons he mentions in favor of the plan he proposes is that British carriage builders "would have nothing new to trouble themselves about." They would build the carriage bodies in their existing factories, while engineers would build the motors in existing foundries, and these separate productions would be joined together, and all would go well.

This doubtless sounds easy, but it ignores one

great truth. All industrial movements have their leaders in organization as well as in invention. These executive leaders build up independent plants of their own, where all processes can be under their own supervision, and the ultimate ideal for which they are striving can be better realized. First come the engineers, who design a symmetrical and practical machine, every part adapted to its special purpose, and not merely imitated from some other form of construction. Then come the manufacturers and organizers to put into tangible shape the ideas of the engineers. But first we must have the true conception of the subject, from which will come the true type of the motor vehicle.

It is not probable that the motor vehicle industry will differ much in its development from other industries of recent date. Large factories will spring up wherein vehicles will be made complete, or nearly so. A few parts may be turned out in the early stages by other manufacturers holding patents or special processes, but the unmistakable tendency is to the development of large independent factories. Later, specialization will strongly assert itself and large manufacturers of parts or accessories will find a place according to the law of the division of labor.

Pioneers in the development of the motor vehicle welcome to the fold all who with brain or capital desire to forward this great industrial movement. But let none who contemplate lending their aid be consoled with the belief that they will have "nothing new to trouble themselves about." The attitude of the carriage builders up to the present has been too much that of onlookers rather than students, and if they wish to take a worthy part in the new industry, they should forthwith begin to trouble themselves about something new and produce something new besides.

That "Motor Derby."

The Motor Car Club announces a grand tournament to take place next May in the neighborhood of London. One of the features of this tournament, and evidently its chief feature, judging from the language of the secretary's announcement, is to be a "Motor Derby," or a straightaway race for one mile, over a level course. The club's chief prize and commendation are to be reserved for the vehicle which first makes a mile in one minute.

In booming stocks and dividends has the Motor Car Club quite lost its senses that it should father such folly as this? On all sides people are waiting for practical vehicles. Honest work is needed in shop and study to develop and perfect the different types for every day use. But the Motor Car Club seems unable to treat the subject seriously and invites us away from our duties to take part in its May madness. Nothing more mischievous could be devised at this juncture. A "Motor Derby" next May, with carriages striving to make a mile a minute, would be an international calamity, and under such provocation the Local Board would be justified in reconsidering its rules in relation to speed and putting bits in the mouths of these horseless Hotspurs.

Happily not all believers in the motor are bereft of their senses. There are two distinct branches of the business now—the motor and the promoter. The intelligent investor and purchaser will have no difficulty in discriminating between them.

Advent of the Business Wagon.

While most inventors on this side began at the pleasure side of the motor vehicle—probably through foreign example—others have been working on the business wagon, which offers a still more inviting field. We publish in this issue an illustration of the first motor van built and operated in the United States. May the type increase and multiply! There is sore need of them in cities, and once they are within reach the heavier work wagon cannot be far away.

Engine Versus Motor.

Patent reports and other current literature show that some inventors are yet wedded to the term "engine" as applied to a source of power for road vehicles. This is a mistake. The term, with all its reminiscences of licensed engineers, boilers and ponderosity, should be rigidly excluded from the literature of road locomotion. Let the true word motor come in, as the old year gives place to the new, and fully occupy the field which is its right. It represents a new idea, in which the licensed engineer, the boiler and the ponderosity have no place. It represents the light, the economical, the safe and simple power soon to be in common use upon the common roads. From this time forth let the engine be relegated to the factory and the railroad.

The English Motor Bubble.

One of the leading articles in the *Automotor and Horseless Vehicle Journal* for December is a vigorous arraignment of the British Motor Syndicate, Ltd., and its recently issued prospectus, in which the promoters of the company claim that they have a monopoly of all the valuable patents essential in the construction of motor vehicles, and that their £1 shares are now sold for £3 in the stock market, making their stock £5,000,000 in value.

The editor of the *Automotor* points out many misstatements and absurdities in the prospectus, furnishes affidavits from persons of influence whose names were used therein without authority, and altogether casts discredit upon it.

While the amount of cash actually paid into this bubble up to the present time is not so large as its promotors would lead the public to believe, it is large enough to prompt our contemporary to close its strictures with these warning words:

"If the promotors of the issue wish to give an earnest of their repentance for the wrong which they must be conscious of having attempted to commit they will voluntarily return the money which they have received. If they do not their last state may be worse than the first—as a court of law may compel them to make the sacrifice."

"Millions in It."

Who says motor patents are valueless? The British Motor Syndicate, Ltd., started with a capitalization of a few thousand pounds 12 months ago, and now the chairman of the company states that with a capitalization of £1,000,000 the £1 shares are freely sold in the market at £3. Wall Street should blush for shame, and go over in a body and sit humbly at the feet of Chairman Lawson and his associates to learn the art of booming stocks.

An American Steam Carriage.

Early in the present month a motor carriage was seen wending its way over the road from Boston to Providence and thence to Stonington, Conn., where, in consequence of a storm setting in, the traveler shipped his vehicle to New York by steamboat.

It was a steam carriage built in the shop of George E. Whitney, designer and builder of marine engines, East Boston, Mass., for C. D. P. Gibson, Jersey City, N. J.

The carriage has bicycle wheels and pneumatic tires, tubular steel frame, chain and sprocket drive, and is controlled in all its movements by a single lever.

The engine and boiler together weigh 111 pounds, the engine being clamped to the side of the boiler and working vertically thereon. It is capable of developing a little over four horse-power, and is geared four to one.

Gasolene is employed for fuel, and the gasolene and water tanks are both placed within the box of the carriage, behind the seat. Sufficient water can be carried to last for a journey of 40 miles.

The steering wheels are pivoted at the hub, and the steering apparatus and whole front gear are fully compensated for all inequalities of the road.

The weight of the rig with full supplies is about 700 pounds, Mr. Gibson states that he had no difficulty in making good headway over all conditions of roads, which are unusually bad now in this section of New England.

Motors at the Crystal Palace.

The annual bicycle show at the Crystal Palace afforded motor promotors little opportunity for display this year. Owing to the extent of the cycle exhibits but a few secured spaces adjacent, namely, the Pennington interests, which had a big display; the Crypto Cycle Co. also exhibiting Pennington motors; the Lane Co,, exhibiting a carriage fitted with a double-cylinder motor, which, it is claimed, gives two impulses each revolution, a tricycle propelled by a two-cylinder gasolene motor and a steam bicycle. The Lane motor is somewhat interesting. The explosive charge is first drawn into the upper end of the cylinder and the valves are filled in the piston itself. Upon the forward stroke the charge passes through these valves behind the piston, and the return of the piston compresses the mixture and simultaneously draws in a fresh charge. The compressed charge being exploded, and the piston having traveled about one-third up the cylinder, the exhaust port is opened, the burnt gases escape, the exhaust port closes again, and the new charge, already before the piston, flows through its valves to be compressed and exploded behind the piston in its turn.

Robert J. Million's System of Transmission.

Robert J. Million, Monticello, Ind., is building a motor buggy for his own use which weighs only about 300 pounds. It is steered at the hub by a lever and controlled by a brake operated by the foot and at the same time controlling the throttle.

Power is transmitted direct from the motor shaft to the rear axle without the use of belts, chains, friction pulleys or cog gears, adjusting itself automatically to the load. For a hard pull speed is reduced to one-third of the high-speed limit, while three times the power is developed.

This principle of transmission, Mr. Million believes, is applicable to all classes of vehicles, light and heavy.

The George N. Pierce Co. has been organized at Buffalo, N. Y., to manufacture bicycles and road vehicles. The capital stock is $280,000, and this company succeeds Geo. N. Pierce & Co., well-known manufacturers of bicycles.

Herrick & Burke, 150 Nassau Street, New York, have taken up the electrical end of the motor vehicle, and are prepared to give the benefit of their wide experience as designing and constructing electrical engineers to inventors and companies wishing expert assistance of this kind.

The Altham Hydrocarbon Motor.

George J. Altham, an inventor of Fall River, Mass., is reported to have perfected the hydrocarbon motor on which he has been engaged for several years past, and the Boston *Herald* of a recent date contains a full-page article on the inventor and the invention.

The chief claim made for the Altham motor is that it dispenses with the water jacket, air being employed to cool the cylinder, mixed with gas in such proportions in the cylinder that the temperature of the latter is said never to exceed that of the steam cylinder using steam at a pressure of 200 pounds, *i. e.*, 380 degrees.

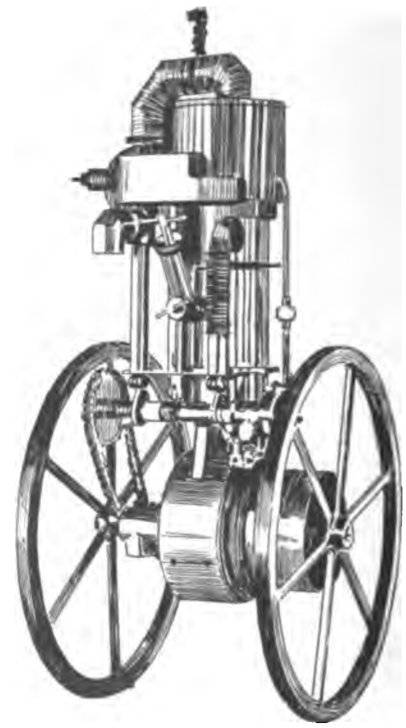
We reprint the following description of its operation: "There are two separate air supplies, one to the combustion chamber directly where the oil is volatized into gas and by the addition of air made into an explosive compound, and the other where it is taken in for the purpose of clearing out the products of combustion. In the lower and inclosed part of the motor on one side is a port through which air is drawn for the purpose of cooling the cylinder. This is effected by means of a slot or elongated opening in a plate attached to the crank-shaft which operates at one section of its revolution as a valve to close the port against the inlet or outlet of air. This slot is opposite the port on the upward stroke of the piston, and, when the latter has reached its zenith, the slot has passed the port, and the downward stroke sends the air drawn in up to the cylinder through a tube, where it drives out the gases produced by combustion. At the next stroke it delivers more air—for the impulse is given every second stroke, so that when the next charge is delivered the cylinder is thoroughly cleared of gases and filled with air, which not only completes combustion, but acts as a kind of cushion to the explosive impulse, making it a sustained impulse, like that of steam, imstead of one that spends its energy in the first part of the stroke.

"The impulsive explosion does not occur in the cylinder proper, but in an outside combustion chamber, connected in such a way as to keep the explosive charge separate from the air in the cylinder until the instant of ignition. Not only does the air in the cylinder act as a cushion to the explosive impulse, but by mingling with the latter lowers the temperature of the charge materially, with no loss of energy in the larger volume in the cylinder, as there is in the charge itself; so that while a lower temperature is thus secured, the volume of the combined gases is so much larger that a sustained impulse like that of steam is secured, instead of a violent one, which calls for heavier construction, and especially for heavier fly wheels.

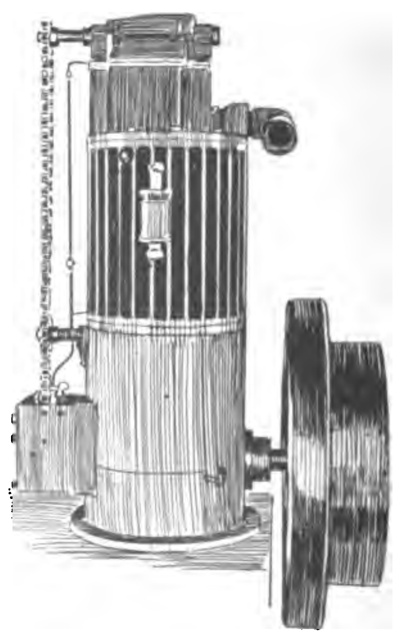
"Another advantage obtained in the Altham motor by thoroughly removing all products of combustion after each explosive impulse, and filling the cylinder with air, is that explosions can be made more rapidly in it than in ordinary gas or oil engines, and thus, in the case of a road motor, greater speed can be attained. The little motor here illustrated, weighing but 25 pounds, runs at a speed of 2,000 revolutions per minute (delivering to the machine operated 1,000 revolutions); its fly wheels weigh only six pounds, and it has been tested to deliver two-thirds of a horse-power. This little motor attains the speed indicated, and does its work with very little vibration."

The methods of supplying the petroleum to the vaporizer and of igniting the charge, are said to be highly ingenious, but are not described.

Several different sizes of the Altham motor have already been constructed, one of two-thirds horse-power, a second of six horse-power and another of 30. The weight of the six-horse motor is 200 pounds, and Mr. Altham is now constructing a carriage propelled by it.



ALTHAM MOTOR, TWO-THIRDS HORSE-POWER.



ALTHAM MOTOR, SIX HORSE-POWER.

M. DELAHAYE.

PANHARD & LEVASSOR.

PANHARD & LEVASSOR.

LANDRY & BEYROUX.

PEUGEOT & CO.

PEUGEOT & CO.

RECBNT FRENCH MODELS

Recent French Models.

We give our readers in this issue illustrations of a number of the carriages which competed in the Paris-Marseilles race.

Of these Nos. 6, 8 and 5, Panhard & Levassor's, are propelled by Daimler motors of four or six horse power. These motors are placed in the front of the vehicle, are vertical, and employ the hot tube ignition.

Cut gears give the different speeds; the wheels are fitted with solid tires and are pivoted at the hub.

Numbers 44 and 46 carry the new horizontal Peugeot motor of four horse-power, with two parallel cylinders and pistons working in the same crank shaft.

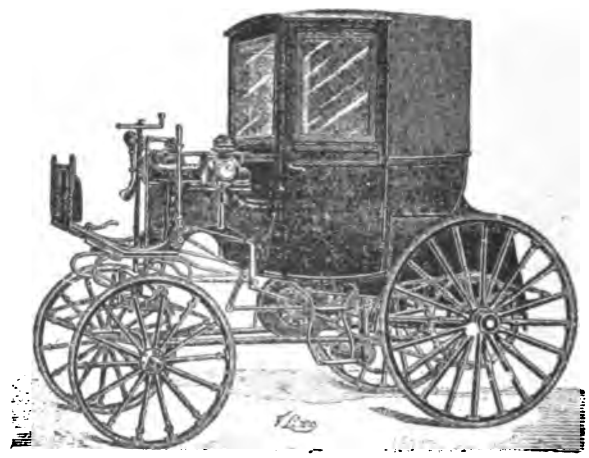
With the exception of the motor the Peugeot carriages differ little mechanically from those of Panhard & Levassor.

The carriages numbered 41 and 42 also carry two-cylinder horizontal motors invented by M. Delahaye, but the ignition is electric instead of by the hot tube, and the transmission is by pulleys and cross belts, and sprocket and chain. The wheels are fitted with Michelin pneumatics.

The vehicles of the Maison Paris Voitures Automobiles are driven by horizontal Benz motors of four horse-power, with single cylinders and electric ignition. Transmission is by belts and the rubber tires are solid.

Landry & Beyroux's carriage, No. 26, is propelled by a four-horse vertical motor of their own construction, rather heavy, but reliable in its action. Ignition is electric, and transmission is by gears.

M. BELVALETTE.



ROGET COUPE.

Two Contests in England Next May.

The London *Engineer* of Nov. 20 announces that its 1,100 guinea motor vehicle competition, which was originally set for last October and was indefinitely postponed, will probably take place on May 24, entries to close March 31.

The secretary of the Motor Car Club also announces that it is the intention of the club to hold a great motor competition some time in the same month, at which £2,000 in prizes will be distributed.

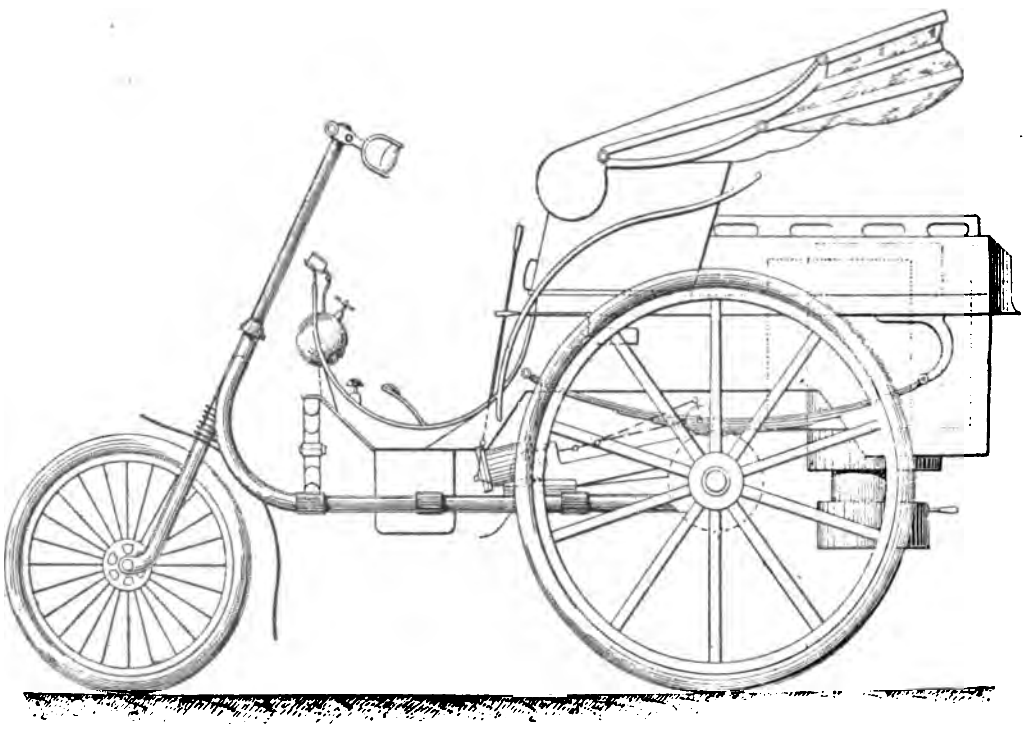
If sufficient entries are received from British inventors and builders the contest will be confined to them, but if not, foreign inventors will be allowed to compete.

While design, consumption of fuel, etc., will not be overlooked in making awards, the chief point to be considered will be speed, and to enable this to be shown to the proper advantage the club proposes to engage some race track or other suitable grounds within easy access of London, where a full, level, straight mile can be run. This mile race will be known as the "Motor Derby."

ROGET DELIVERY.

The Paris Omnibus Company have issued a circular to all motor manufacturers calling attention to a plan for an omnibus to carry 30 persons, which the company has partially drawn up, leaving the details of the motor and transmission to the manufacturer. The weight of the vehicle is limited to about 8,000 pounds, and it is expressly stipulated that the motor must give off no steam or disagreeable odor.

MOTOR CYCLE.—C. CRASTIN, HOLLOWAY, ENGLAND.



THREE-WHEELED STEAM CARRIAGE.—M. SERPOLLET, PARIS, FRANCE.

The Serpollet Steam Tricycle.

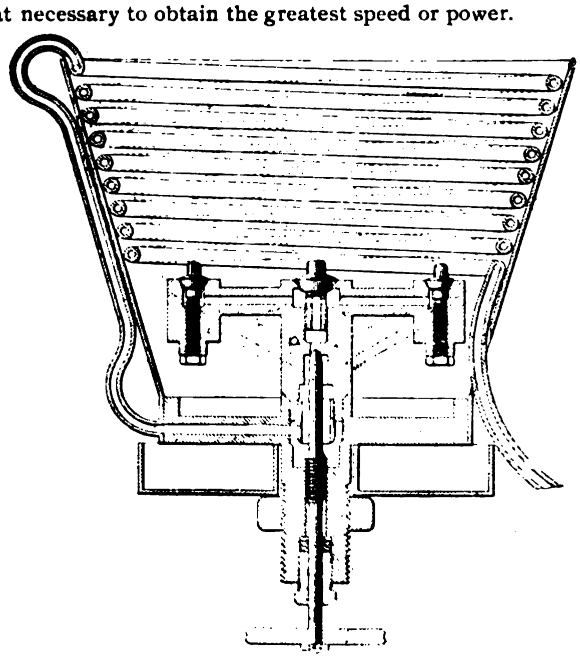
The light steam tricycle which M. Serpollet recently constructed to illustrate the possibilities of his system for this class of vehicle weighs, ready for the road, about 1,100 pounds, and carries two persons.

The fuel is petroleum, which is carried in a tank under foot, containing sufficient for an 80 or 90 mile journey.

Enough water can be carried in the tank behind to last for 30 miles. By means of a condenser M. Serpollet hopes to raise this limit to 80 miles.

Steam is generated in a Serpollet boiler having an extraordinary total heating surface. This boiler is heated by a new burner, called the Longuémarc, which M. Serpollet has adopted as the best for his purpose.

This burner, which is kept under pressure, has five branches, feeding separate flames. When required a valve in the main feed of the burner cuts off the supply from part of these, leaving only two burning. In this manner the pressure in the boiler may be quickly changed from a very low point up to that necessary to obtain the greatest speed or power.



LONGUÉMARC BURNER.

The petroleum is forced into the reservoir by a pump, in order that it may reach the cylinder under pressure. A valve is provided to regulate its flow to the burner.

The conductor has before him two pressure gauges, one for petroleum, the other for the steam, and it is necessary for him to start the pump from time to time, in order to keep up the pressure in the petroleum reservoirs.

The engine makes 675 revolutions and develops four horsepower. On a level a speed of 24 miles an hour is easily attained. On grades of 4 per cent. 18 miles an hour can be made, and on grades of 17 per cent. a speed of seven miles an hour is claimed.

This vehicle was originally constructed in 1889, and was designed to burn coke, but the new burner will, it is believed by some, make it possible to construct four-wheeled steam pleasure carriages for two and four persons that will compete with the gasolene vehicles.

The Crastin Motor Cycle.

According to the *Autocar* C. Crastin, of Holloway, Eng., has designed and fitted to a light quadricycle an oil motor which weighs less than 50 pounds complete.

The motor is of the Otto type, a double-acting cylinder, and gives an impulse at each revolution. A water jacket is used, as also a carburetor and hot tube when paraffine oil is the fuel consumed, but when the higher grade of oil is in use, a battery is substituted for the hot tube, and the carburetor is dispensed with.

The castings forming the supports for the cylinder tube, combustion and cooling chambers, covers, brackets for crank, shaft, gearing and crank, are made of a special alloy of aluminum, while the brackets and castings for holding the cylinder tube are made to clamp on to any ordinary tricycle. The design and construction of the motor are somewhat novel, as the cylinder is formed by a long steel tube, which is slotted midway in its length. Within it fits an inner tube with closed ends, forming a double-ended piston. The piston stroke is 4 inches by 1¼ inches.

The motor may be used single-acting for level roads, double-acting for uphill work, and may be thrown out of action for downhill running, while means are provided for easy starting and for preventing a charge entering the cylinders and compressing when not required. This particular machine is geared to 10 miles per hour at 500 revolutions per minute, but various speeds may be obtained by changing the toothed wheels.

The Weidknecht Steam Omnibus.

One of the latest experiments in steam vehicles in Paris comes from the shop of M. Weidknecht, and is a huge four-wheeled affair resembling a tractor, weighing six tons, and propelled by a 34-hp steam engine.

It is not intended for use on the streets of Paris, but for extramural service, as a 'bus at railway stations or to convey excursionists from place to place.

The car or coach where the passengers are accommodated is entirely independent of the engine and boiler. The driving wheels are forward and the steering wheels in the rear, as all the heavy machinery is forward. A speed of 24 miles an hour can be developed by its powerful engine, but a limit of nine miles an hour is fixed by law for such heavy vehicles.

Whether so heavy a vehicle will prove durable on country roads is yet to be proved.

Harrington's Steel Carriage Wheel.

The Coupé Company, carriage builders and wheel makers, of Britannia Road, Fulham Road, London, are sole manufacturers of Harrington's patent steel carriage wheel, which is likely to be extensively used in motor vehicles.

Owing to the construction of this wheel it is said to be impossible to buckle it. Each pair of adjacent spokes is secured together by a band of steel riveted over them at a point near the rim of the wheel. The wheels bear a close resemblance to those of a bicycle, and as they are as cheap to produce as wooden wheels and are lighter and stronger an extensive sale is predicted for them.

CORRESPONDENCE.

Nuggets of Experience Freely Given.

YOUNGSTOWN, O., Dec. 15, 1896.

Editor Horseless Age.

DEAR SIR:—Many people are writing me from all over the United States in regard to my motor carriage, wanting designs, ideas, catalogues, prices, etc. As I am very anxious that these vehicles come into general use, I feel that those of us who are in the business *for the general advancement* should do all we can to help toward perfection those who are designing motor carriages. I feel that I have a practical carriage, though not quite perfect yet for all conditions of road. The only improvement I have recently made has been to lighten it as much as possible. The more I use it the better I like it and the more of a necessity I find it to be. I am using it every day and night. Have made all of my night calls with it since last July, so you understand it is a real live thing.

The main drawback to my carriage is the want of proper means of transmitting power. I have inquired into all known means, and find nothing that I deem advisable to use that offers any advantages over what I now have, *i. e.*, chain and sprocket.

The ideal system of power transmission for a motor carriage, in my opinion, should satisfy the following conditions:

1. It should give all speeds from 0 to 20 to 30 miles per hour, and be positive in every position.
2. It should give the full power of the motor on the slowest speeds for hill climbing, bad roads, etc.
3. It must be noiseless, or nearly so.
4. It must be light, not to exceed 100 pounds.
5. It must not require much attention, and take up little space.

A three or four speed clutch would answer nicely if such a thing could be produced, used in connection with chain and sprocket. Perhaps variable speed cones would answer if properly modified, but the manufacturers seem loth to experiment with a view to producing them for this purpose. While these cones would give all speeds noiselessly, I am afraid the lowest speeds would not be positive enough for hills. I am in hopes that hydraulic power transmission will be accomplished. Water, or better, oil, would make an ideal means of changing speed and getting power on the slow speed

I believe that a carriage motor should have only one cylinder, as that is all that one will care to look after; should not weigh to exceed 75 pounds per horse-power; should be as simple as possible, so that it can be quickly taken apart and parts repaired when necessary.

The crank should be inclosed to keep out the dirt and deaden the noise of explosion.

The motor should not make any noise in itself at the time of explosion. The exhaust can be easily muffled.

Two cylinders may be used on motors of four horse-power and over, if desired, and if the motor is properly balanced the carriage will not vibrate disagreeably. Three horse-power is sufficient for a light carriage for two people.

The motor should be attached to sills which rest on the springs, and the body of the vehicle should be made in such a manner that it can be lifted off or turned up to allow inspection of the motor and transmitting mechanism.

I believe the solid rubber tire is best for all kinds of roads. Pneumatics run hard in mud. The tire should have a flat surface instead of oval.

The whole carriage should be as near noiseless as possible, and should be so proportioned that its weight and power will correspond, to enable one to ascend easily any grades that are met. I find that a three hp-motor will take 1,200 pounds up a 17 per cent. grade on a dirt road, and will run my carriage with three in (1500 pounds) on brick pavement or a race track at a speed of 20 to 25 miles an hour. A rig for two people should not weigh to exceed 700 pounds, to get the best work out of it.

Four springs under a motor carriage body, one under each corner, steady it wonderfully.

I trust the above free knowledge, gained in the school of experience, may be of some use to those who are building motor carriages. If we can be prevented from going over old ground in our experimenting, it will greatly hasten the advent of the perfect carriage. Very truly,

CARLOS C. BOOTH.

Example to Suit Sir David's Precept.

FOND DU LAC, WIS., Dec. 13, 1896.

Editor Horseless Age.

DEAR SIR:—I have read in the November issue of THE HORSELESS AGE, under the heading "Sir David Salomon's Address to the Self-propelled Traffic Association," that he is quoted as saying that the reason why a greater horse-power is required to propel a motor vehicle than is necessary when a horse draws the vehicle, lies in the fact that the motive power in the latter case is placed before the load, so that the wheels are lifted over obstructions, while in the former case the tendency is to push the wheels into the ground when an obstruction is encountered. It is a fact that a horse drawing a vehicle lifts the front or steering wheels over obstructions, for the pull is upward as well as forward, and every good teamster wants his horse hitched close to the load. A loaded vehicle that a horse could draw with ease hitched in the ordinary way could not be moved by the same power if the horse was hitched to it by a long rope. A loaded wheelbarrow can be drawn over an obstruction with less power than it would take to push it over, and a horse can draw a loaded vehicle with less power than it would take to "back it," for the wheels in the latter case are pushed into the ground.

The true cause of a motor vehicle requiring more power to propel it, it seems to me, is not because it has a tendency to push the wheels into the ground. Much power is consumed by friction of the gearing in transmitting the power to the drive wheels, and I believe that if the power could be computed that a horse exerts to carry his own weight, in addition to that required to draw the load, it would about equal that of the motor, the conditions being the same. I think this is the proper way to make the comparison, for the motor has to carry itself and overcome much friction before the power is applied direct, as with the horse. I have seen steam traction engines, such as are used for threshing grain, pull until they lifted their front wheels off from the ground, the drawbar being below the rear axle. If an obstruction was placed before each front wheel so that they could not move forward, and the drive wheels secured so they would not slip and power applied, the tendency would be to lift the front upward. Make the drive-wheels rigid, apply power enough, and the whole

could be made to revolve around the rear axle. The same applies to motor vehicles. Thus it will be seen that they lift their wheels over obstructions when the power is in the rear, the same as with the horse, applying the power in front.

Some motor vehicles have been made with drive wheels in front, but I do not know what advantage is claimed over the rear drive.

It would be interesting to hear from some of the motor vehicle inventors and builders and practical men on "wheels pushing into the ground;" whether greater power is required for a motor vehicle than for the same vehicle when drawn by a horse, etc. Respectfully yours, ERNEST A. MUNZER.

The Rowbotham Motors.

From our English contemporary, the *Autocar*, we gain knowledge of two types of oil motor designed for the propulsion of vehicles by Walter Rowbotham, 27 Vittoria Street, Birmingham, England.

FIG. 1.

No. 1 is a four-cylinder motor, with an electric commutator to time the firing of the charges in the two opposing cylinders, thus minimizing the vibration caused by the impulses. Its horse-power is said to be seven actual, weight (including fly wheel) 145 pounds, length 2 feet 9 inches, width over all 1 foot 8 inches. It is placed crossways in the carriage in order to drive from the crank shaft on to a special reversing and variable speed gear,

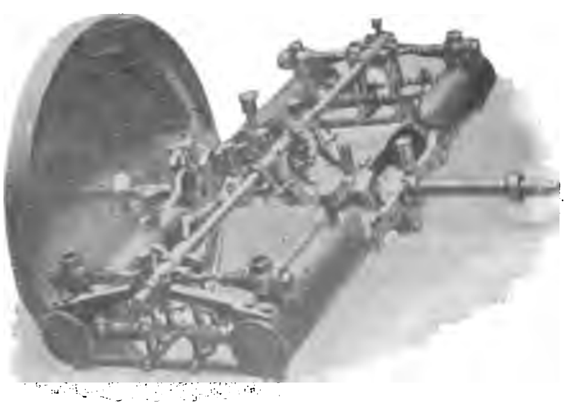


FIG. 2.

No. 2 has the combustion chamber situated between the two pistons in each cylinder, thus avoiding vibration. Its horse-power is said to be 11 actual, weight (including fly wheels) 180 pounds, length over all, 3 feet 8 inches and width 1 foot 6 inches. It is placed lengthwise in the carriage to drive the gear from the half-speed shaft.

Mr. Rowbotham claims that he has been able to discard the water jacket by the use of a special heat-resisting lining in parts exposed to the heat. This lining is also said to assist vaporization and reduce odor.

All the valves are fitted with strong springs and are positive in action, and all working parts are interchangeable.

The Duryea in the Brighton Run.

As there has been considerable controversy in the English motor press over the movements of the two Duryea wagons in the London-Brighton run, and their relative position at the finish, the editor sought an interview with Mr. J. Frank Duryea, who had charge of the leading vehicle, and asked him for an account of his part in the outing.

Mr. Duryea stated that they started near the last, but made better headway through the crowded London streets than the other vehicles, owing to the superior lightness and control of their vehicle.

At Brixton, four miles from the Thames River, he began to push his wagon, until at Reigate, 22 miles out, he had passed all the other vehicles. Here he halted, according to the official programme, took luncheon and waited for the other excursionists.

The several Bollée tricycles, which had left London before him, came up soon after and passed on immediately toward Brighton, one of them reaching that place before him.

After stopping for over an hour at Reigate Mr. Duryea continued on his journey, not, however, until the pilot carriage of President Lawson had led the way.

Rain came on almost immediately, rendering the going much heavier for him than it had been for the Bollées, who passed on early enough to escape it. As it was two of the Bollée machines came to grief, one being completely knocked out, and the other being towed into Brighton by horse-power. Both the Duryea wagons reached Brighton, the second being somewhat retarded as compared with the first, by the fact that its passenger was a man weighing about 250 pounds.

Mr. Duryea speaks enthusiastically of English roads. He says he could as easily make 20 to 25 miles an hour there as 15 here.

He saw nothing during his stay abroad which he believes to be the equal of their latest wagon in speed, control and general utility.

The Duryea Company now has four wagons in England.

THE HORSELESS AGE opens its second volume with the December number, and therefore may be said to have passed the experimental period. It is devoted, as its name indicates, to motor interests and contains many illustrated accounts of the latest inventions and improvements in motor carriages and things pertaining to them. A particularly interesting feature is the publication of letters from manufacturers and students of the motor problem in regard to the progress made during the last year—a year of study and preparation.—*Syracuse Herald.*

MOTOR VAN.—CRUICKSHANK ENGINE WORKS, PROVIDENCE, R. I.

The Cruickshank Steam Van.

L. F. N. Baldwin, manager of the Cruickshank Steam Engine Works, Providence, R. I., has just completed for the firm of Shepard & Co , a large department house of the same city, a steam van for use in delivering furniture and other household goods.

The van was formerly drawn by two horses and no change in it was made by Mr. Baldwin, save those absolutely essential for the attachment of a steam engine, using kerosene as fuel, and developing six horse-power under 100 pounds of steam. With 200 pounds of steam eight horse-power is secured.

The expense of operation is said to be about 10 cents an hour, and sufficient fuel for a day's work can easily be carried in the tank.

Transmission is by chain and sprocket, and the average speed attained in city streets is six miles an hour, though much higher speed is possible on suitable roads.

The Duryea's Representative Flings Down the Gauntlet.

The promoter of the Duryea patents in England is so well assured that the wagon he represents is able to cope with any the Motor Car Club may be exploiting that he has sent a challenge to the secretary of the club, offering to pit the Duryea wagon against any vehicle the club may control, in a contest between London and Glasgow and return, the decision to be rendered not on speed, but on grounds of general utility in road service.

Stakes of £5,000 were to be posted by each side, the whole to go to the winner. Up to the present, according to the best information, the challenge has not been accepted.

The Prouty System of Road Locomotion

Among the American inventors who have taken up the subject of the motor vehicle thoroughly and evolved what they believe to be a complete and practical system, is Enoch Prouty, of Chicago, Ill., whose inventions in this line comprise a gasolene motor, an exhaust muffler and a transmission device.

The motor is a single-cylinder upright, using the electric ignition, the igniting mechanism consisting of a movable and a stationary contact piece. The movable piece consists of a sliding bar or rod, which is brought into contact with the other piece by means of a spring, and separated from it by a cam or other positive-acting mechanism. In this way the two electrical connections may be brought yieldingly into connection with each other with the fixed and definite degree of pressure due to the tension of the spring, and then positively separated by the cam, thus ensuring the proper making and breaking of the circuit, and avoiding the jamming of the contact pieces.

In the valve mechanism the spring which holds the exhaust valve closed is made sufficiently stronger than the spring holding the inlet valve closed to cause the inlet valve to be opened only by the suction of the cylinder when the piston is making its outward stroke, hence the air and vapor can be drawn into the cylinder only through the inlet.

The exhaust valve is opened by a cam on the cam-shaft of the motor.

The vaporizing chamber is connected directly with the valve chamber, and within the vaporizing chamber the gasolene feed pipe terminates in an annular nozzle or feed orifice, projecting upward toward the inlet valve, and discharging the liquid in a thin, annular sheet. As this feed pipe is positively closed by a valve near its orifice, the instant the required quantity of fluid is forced into the vaporizing chamber by the feed pump, the suction of air through the vaporizing chamber is prevented, when passing the feed orifice, from drawing the gasolene from the feed orifice and causing irregularities in the feed.

The feed pump is operated in one direction by a spring and in the other by a cam.

The governor comprises a disc or wheel, to which are pivoted on quadrant arms two diametrically opposite weights connected to the opposite arms of an oscillating lever on the cam shaft of the motor by means of pivoted links. The weighted arms are pulled toward each other by springs and forced apart by centrifugal action as the disc revolves. Connected to the weights are a pair of slides that engage the tapering end of the sleeve, which carries the pump-operating cam. The sleeve is adapted to reciprocate on the cam-shaft of the motor, so as to throw the cam into and out of engagement with a roller on the pump-actuating slide. The roller and the cam are both made cone-shaped or flaring, so that a very slight sliding movement imparted to the sleeve by the governor-operated slides will suffice to move the sharp or tapering edges of the cam and roller into engagement or past each other, and then the further revolution of the cam, by reason of its tapering or inclined face, will itself operate to further reciprocate the sleeve and thus bring the cam into full and proper engagement with the roller. A very slight movement of the governor will therefore serve to control the pump and the consequent feed of liquid to the motor. A spring serves to move the reciprocating sleeve in the opposite direction to that in which it is moved by the governor-actuated slides.

The sound-muffler consists of a chamber several times the capacity of the cylinder, which is furnished with an interwoven wood-slat and wire-screen bottom or sides. Several thicknesses of wire screen or netting are interwoven with the slats and through this the exhaust passes and is scattered. The motor is started by means of an explosive cartridge.

The water tank which is placed over the cylinder has an open top and whatever steam may be generated in the water jacket escapes through the body of water in the tank and reaches the top, while the feed pipe supplying the jacket leads from the bottom of the tank.

But Mr. Prouty believes that the one important thing in the use of the gasolene engine for locomotion is the transmission of the power to the vehicle, and as he seems to have evolved a method that is new to our readers in this application, we shall allow him to describe it in his own words.

He says: "Steam and electricity are flexible, and so must any power be in its application to road motors. In cable systems is seen a continuously operating power applied to vehicles. The moving cable is caught on t. by a *clutch*, ordinarily called a grip. It is simply a clutch adapted to impinge a rope. It is a success. The gasolene engine is the equivalent of the continuously moving cable, and all that remains is to find the *clutch*, or *grip*, that is the other equivalent. The cable clutch, or grip, works because it impinges the rope, and directly on the face, and further has no high periphery motion to induce excessive wear and heat. Lay down a stationary groove full length of the cable to support it and force the *clutch*, or *grip*, *down on the top of it* and how many cars would it move, and how long would either the grip or the cable last? But such a construction would be nothing more or less than the ordinary *clutch*, with its *thrust collar* in the place of the groove. In the illustrations is shown an impinging clutch, or grip, that is absolutely the equivalent of the clutch, or grip, on cable systems. Any reader of ordinary mechanical perception will at once see how this is the fact. This is accomplished by compound friction discs. One disc is firm on the journal, and one has a pin or key that causes it to revolve while left free to move laterally on the journal. Between these discs is a pinion that is free in the journal, which meshes in the gear on the wheel. A spool-shaped wheel sets over the outside beveled discs, by which they are caused to impinge the pinion so as to produce any degree of friction desired. There is no thrust collar, and therefore no counter resistance as an element of uncertainty in the result. The mechanical action of these discs is the same as that of a cable grip, capable of being impinged to any degree of resistance desired. And this clutch is as flexible as that on cable systems, the success of which is not questioned. And there is the additional advantage that gear can be used connecting directly to the wagon wheels independently, and the *inside* wheel can always be freed on curves. The power is graduated up to the maximum by the law of speed and force exactly the same as on cable systems, and it is well known less rated power is used per car on cable than electric lines. Without anti-friction the power consumed is measured by the weight and motion of the vehicle, and hence by the use of this clutch the engine will start any load that it will draw at its maximum.

"Unless fundamental principles in science and mechanics cannot survive equivalent interchange, the solution of the practical road motor is with us."

FIG. I.

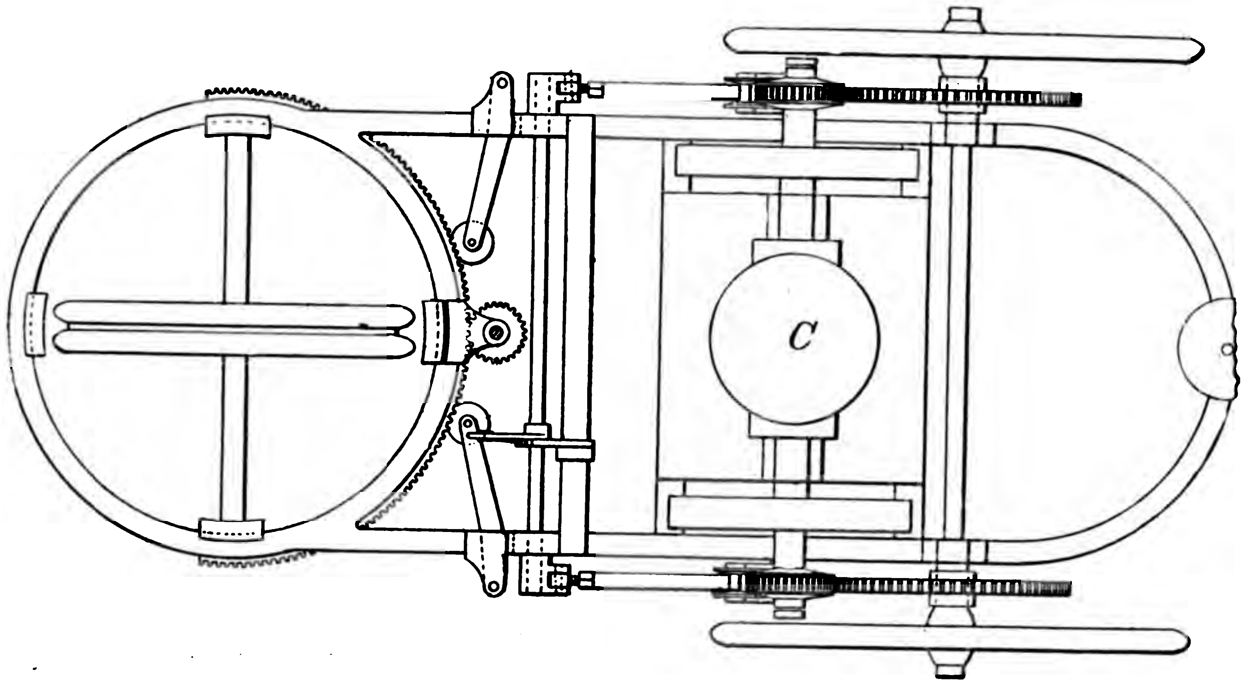


FIG. 2.

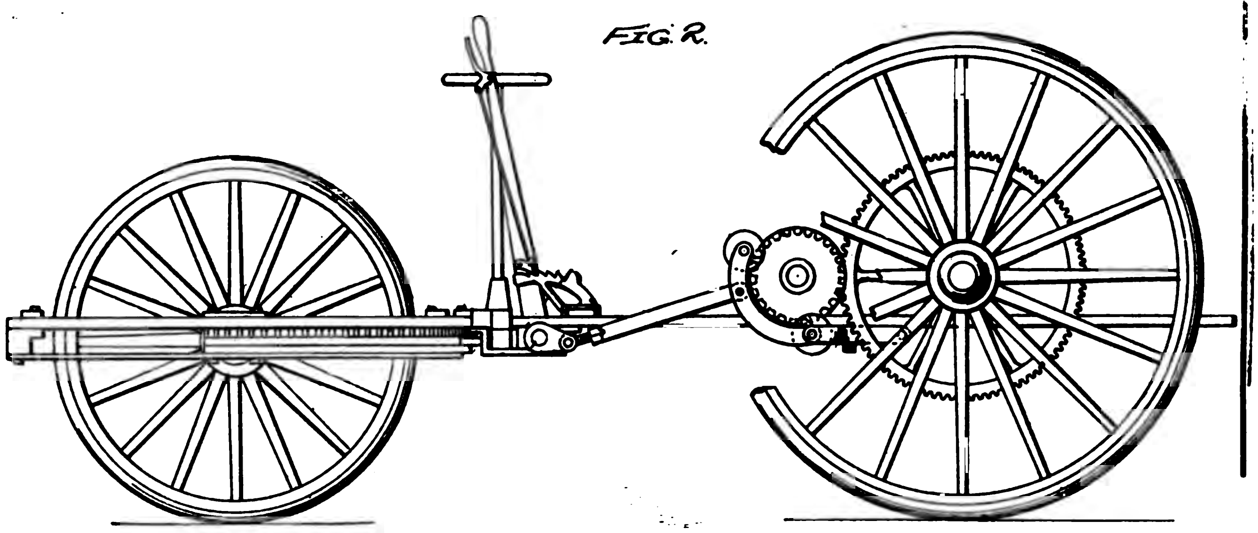
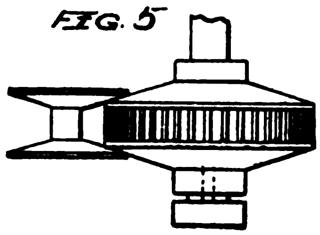


FIG. 5



MOTOR VEHICLE SYSTEM. ENOCH PROUTY, CHICAGO, ILL.

Broad Claims on a Hydro-Carbon Road Engine.

Since the possibilities of horseless road locomotion have become apparent to the popular mind and capital has turned its attention to it as a field for investment, there has been much speculation in regard to the value of patents in this line of invention.

Many have contended and still contend that no basic patents can be held in the application of a hydro-carbon engine to the propulsion of road vehicles. Others, however, are more confident in this respect, hoping as the industry develops to realize from some old claim, now almost forgotten or at least overlooked by the average investigator, that generous reward which Uncle Sam occasionally gives to pioneer inventors in great industrial lines.

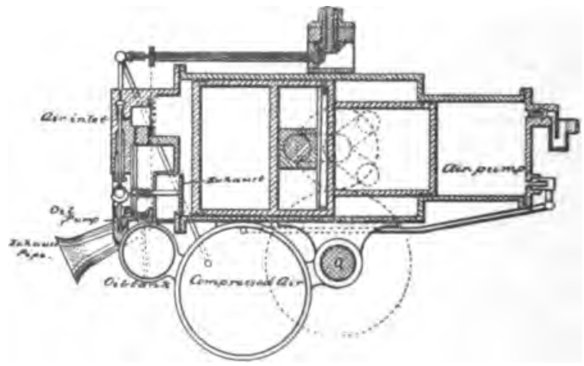
For the searcher among the files of the Patent Office under the class of road engines, or vehicle motors as they would now be properly called, one patent is of preëminent interest because of the early date of the application and the broad and generous nature of the claims. It is patent No. 549,160, dated Nov. 5, 1895, and granted to George B. Selden, a patent attorney of Rochester, N. Y. Although this patent was granted only last year the application was filed on May 8, 1879.

The title of the patent is "Road Engine," and in the preface to his description the inventor calls attention to the difficulties that have been encountered in the attempt to apply steam to this purpose, and claims by the use of a hydro-carbon engine to so reduce the weight and fuel supplies as to render his engine a practical "road engine."

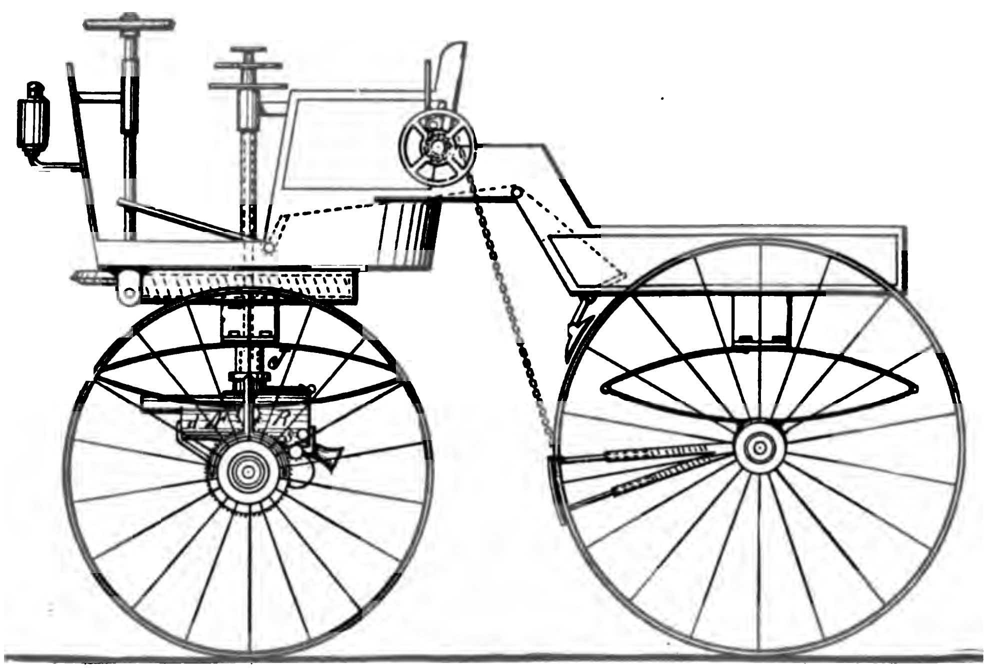
The body of this vehicle is of any conventional shape, accommodating few or many people. The driving is done with the front wheels, and the steering with the hind wheels. A fifth wheel is employed, and a foot brake, operating upon the hind wheels.

The "road engine" may be any one of the compression type, and the inventor prefers to attach it to the front axle, placing the cylinders transversely to the driving shaft, and connecting them with a compressed air tank, carried on the axle below the engine, and filled by an air pump of usual construction.

The engine illustrated here is supposed to have three cylinders, and as the principles involved are now well known to our readers no further elucidation is necessary.



Several different methods of transmitting the power to the wheels are suggested, and clutches are provided on the axle to enable the wheels to rotate independently in turning corners. In order to operate the clutches and valves of the engine flexible connections are employed, passing into a journal on the engine. Above this journal each connection is provided with a universal joint which permits the oscillation of the driving shaft with reference to the body of the carriage.



"ROAD ENGINE."—GEO. B. SELDEN, ROCHESTER, N. Y.

It is recommended that the machinery be boxed in to protect it from dust, and reversing gears, similar to those used to reverse the motion of the feed screw in engine lathes, are suggested for backing the vehicle. The central space between the cylinders and the air pumps may be used as a cooling chamber, and provision is made so that the engine may be run continuously while the carriage stops.

The inventor contemplates the application of his system to ordinary styles of carriages in daily use.

So much for the explanation of the invention, but the most important part of this patent is yet to come. As a preface to his claims the inventor says:

"I am aware that steam carriages for use on common roads have been heretofore constructed on many different plans, but I am not aware that previous to the date of my invention any attempt was made to reduce the weight of a road locomotive by the production of a compression liquid-hydrocarbon engine capable of locomotion, or that there was described or constructed a compression hydrocarbon engine of such a design that it was capable of propelling a road locomotive, more especially when the engine was so designed as to leave the body or platform of the carriage practically unobstructed for the conveyance of passengers or freight, except by the handles or wheels necessary for the guiding or controlling of the vehicle and the regulation of the engine.

I am also aware that it has been heretofore proposed to use liquid fuel in the furnaces of steam road-carriages for the purpose of generating steam for propelling the same—as shown, for instance, in English Patent No. 1,538 of 1863—and such arrangement, which does not remove any of the objections hereinbefore mentioned, I hereby especially disclaim.

"I do not claim herein anything shown or described in the following English patents: No. 8,207 of 1839, No. 6,052 of 1830, No. 2,737 of 1871, No. 6,955 of 1835, and No. 780 of 1865.

"I am also aware that it was suggested in English provisional specification No. 10 of 1878, that petroleum or other like motors 'might be used to provide motive power' for tram-cars and other self-propelling vehicles.

"I claim:

"1. The combination with a road locomotive, provided with suitable running gear including a propelling wheel and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device and a suitable carriage body adapted to the conveyance of persons or goods, substantially as described.

"2. The combination with a road locomotive, provided with suitable running gear, including a propelling wheel and steering mechanism, of a liquid-hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid-fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, and a suitable carriage body located above the engine, substantially as described.

"3. The combination with a road locomotive provided with suitable running gear, including a propelling wheel and steering mechanism, of a liquid-hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid-fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, a suitable carriage body located above the engine and a flexible or jointed connection between the engine and the body, substantially as described.

"4. The combination with a road locomotive, provided with suitable steering mechanism, of a hydrocarbon engine applied to the driving axle and having flexible valve or clutch connections located within the steering mechanism, substantially as described.

"5. The combination with a road locomotive provided with a propelling wheel, of a liquid-hydrocarbon gas engine of the compression type, comprising two or more working cylinders and pistons arranged to act in succession during the rotation of the power shaft, a suitable liquid-fuel receptacle, suitable devices for transmitting motion from the power shaft to the driving axle, and a clutch or disconnecting device, substantially as described.

"6. The combination with a road locomotive, provided with a propelling wheel, of a liquid-hydrocarbon gas engine of the compression type, comprising one or more unjacketed working cylinders communicating with a closed crank chamber adapted to hold a cooling liquid, and a power shaft geared to run faster than the propelling wheel, substantially as described."

Sprockets and Chains.

The problem of selecting a suitable transmission chain for a motor wagon has been found a difficult one by many inventors in this line. What is required is a chain that will not stretch, wear out too fast nor catch up too much dust and dirt, and is perfectly true in pitch.

The Boston Gear Works, 31 Hartford Street, Boston Mass., recommend for this purpose their special heavy machine-made steel chain, which, having the stud accurately fitted to perfect seamed bearing, has little tendency to wear, runs smoothly, stretches little, and consumes less power than the average chain.

An important feature of this chain is the special oiling device, which is claimed to press the oil out, and not to suck it in with dust and dirt, rendering oiling unnecessary oftener than once in two or three months.

For the year 1897 the best grades will be made with tool steel rivets, and the sleeves can be case-hardened if desired.

Sprockets to fit are also manufactured by this concern.

The Baker Motor Carriage.

Herbert C. Baker, of Hartford, Conn., has entered into arrangements with English capitalists to found a motor carriage business at Manchester, Conn., on the opposite side of the Connecticut River from Hartford.

The plant formerly occupied by the Mather Electric Company has been secured, and a force of men are now at work on the first model of the Baker motor carriage, which, it is hoped, will be completed within three months. Until this time particulars are withheld.

It is also within the company's plan to manufacture boat motors and motors for general stationary purposes.

The Strieker and Blum Gasolene Bicycle Motor.

The accompanying photos illustrate a motor bicycle constructed by J. H. Strieker, of 459 West Eighth Street, Anderson, Ind., and Edward Blum, of Cincinnati, O., weighing all told 65 pounds.

On Saturday evening, Oct. 31, it was tried for the first time on the streets of Anderson, and subjected to a severe trial, carrying a rider up a grade and against the wind at the rate of 10 miles per hour. It withstood the ordeal beyond the inventor's expectations.

The motor is of the four cycle type, using no gasolene tank, but receiving its gasolene from the tubing of the bicycle frame. No carburetor is employed, and the power developed is claimed to be three-fourths of a horse-power.

The receiving valve is so constructed that the air and gas are perfectly mixed, consequently no disagreeable odor or smoke are noticeable at the exhaust. The motor is practically noiseless, the exhaust being muffled so that it cannot be heard. Water surrounds the cylinder to keep it cool, though the waste heat is said to be utilized in various ways, so that a quart of water is enough for a whole day's journey.

In riding, it is said, there is no unpleasant sensation. No vibration is felt, the machine is easy to handle, the low centre of gravity gives stability and safety, and the weight is well distributed to both wheels.

MOTOR BICYCLE.—STRIEKER & BLUM.

Speed is regulated by the small idler pulley on the side. With this arrangement one can go as slow as a snail or as fast as 10 miles an hour.

The governor is claimed to be one of its strong points, as it does not weigh an ounce, but is very sensitive, controlling the speed of the motor admirably from 150 revolutions up to 900.

The ignition is electric, a battery carried in a box near the steering head, being used for the purpose.

Power is transmitted from the motor to the bicycle by means of a ¼-inch waterproof cable and pulleys, in lieu of sprockets and chain. This power transmission is noiseless and under absolute control, the bicycle starting smoothly, without jerking and running with equal ease at all speeds.

The motor need be started but once. After that the rider mounts in the usual way, puts his feet on the foot-rests (pedals are entirely dispensed with), depresses the handle and pulley on the side near the saddle, which causes the cable to adhere to the pulleys—and away he goes.

When he wishes to stop he raises the handle and pulley and the cable ceasing to adhere to the pulleys, the bicycle comes to a stop by putting on the brake, which is of the kind usually employed on bicycles. The rider can lean the machine against a tree, post or anything strong enough without stopping the motor. To stop the motor the supply of gasolene is shut off.

The motor is claimed to be so simple that any one after being instructed can manage it, and the cost of operation is low because the piston closely approaches the head and all but a very small proportion of the burnt gases is expelled, and as the cylinder is completely filled with fresh gas, efficiency is increased, which means more power and less gasolene.

All bearing surfaces are large and are provided with suitable automatic lubricating devices. The inventors admit, as stated in a recent issue of THE HORSELESS AGE, that bicycle manufacturers and others who have studied the bicycle motor problem are well aware that the extreme lightness of the machine at present demanded almost precludes the attachment of any motor directly to the frame, but they have, nevertheless, taken the bull by the horns and designed a motor to fit in the strongest portion of the bicycle frame, *viz.*, the crank hanger and immediate section, and have such a light motor that they believe the strain on the frame is less than when pedals are used. The motor is attachable to and detachable from the frame. Should one tire of mechanical power and wish to use pedals for exercise, 15 minutes will suffice for the change.

The tubing of the bicycle frame which constitutes the reservoir for the gasolene holds enough for 25 miles more or less, according to the road-bed.

The motor in future will be enclosed in an aluminum casing to exclude all dust or grit.

The motor is here attached to a bicycle of regular construction, and while this one is only capable of running a bicycle 10 miles an hour, by an increase in the size of the cylinder it can be made to run at any desired speed.

Prall's Rotary Gas Motor.

A rotary gas motor has been on exhibition the past month at the Hotel Arno, Washington, D. C. This motor, though only 12 inches long and 8 inches in diameter, is said to generate 45 horse-power, and to run equally well on gas, gasolene or kerosene.

The mechanism is thus vaguely described by a daily paper:

"The oil is heated up to the volatilization point by a small auxiliary lamp, and then injected into the cylinder, about an inch in internal diameter and 8 inches in length. At the same time, a small rotary pump forces in a supply of fresh air in sufficient quantity to produce perfect combustion.

"By its own heat the gas expands nearly two volumes, and after it has passed through the motor this residual heated vapor is utilized to still further increase the temperature of the compression tube, until the effective working expansion is multiplied ten times. The above is the first and requisite step toward gaining the required power to actuate the motor proper, a step analogous to generating steam under high pressure to run an ordinary engine.

"The outside shell or casing of the motor is a heavy cast cylinder. Through each end of the cylinder passes the driving shaft, which may be directly coupled to a piece of machinery or be the axle of a vehicle itself.

"The clever portions of the engine, wherein lies its great success, are curiously constructed rotary pistons, or vanes. Mr. Prall terms the motor a concentric vibrating engine, based upon the fact that to each two vanes are attached separate disconnected shafts, which protrude from opposite ends of the cylinder and travel alternately in the same direction, giving a continuous rotary impulse to the main driving shaft.

"One of each pair of vanes is forced around in a constant direction for half a revolution, while the other is held fast by a clutch which prevents its traveling backward. When the half revolution of the traveling vane is completed and both pairs come together again, momentum carries them together for a fraction of an inch, and the locked vane becomes disengaged and the other locks, and the vapor under pressure is again admitted between them, revolving the shaft on the opposite side. The vapor is admitted by axial ports, and the efficiency of the device is much enhanced by using the vapor expansively—that is, after a third of the travel of either pair of vanes the direct pressure of the vapor is cut off and the rest of the revolution is dependent upon the expansion of the gas."

Mr. Prall claims that he can drive this motor as high as 1,500 revolutions per minute. He announces his determination to build a carriage propelled by his motor, and run it from Washington to New York.

The Einig Steam Carriage.

John Einig, a marine engineer of Jacksonville, Fla., furnishes the accompanying illustration of a steam carriage, which he built and has been running for some time.

Gasolene is used for fuel, the consumption being about a quart and a half per hour. The wheels, which are 48 and 50 inches in diameter respectively, are fitted with rubber tires, and the gauge is 40 inches.

The sound of the escaping steam is said to be successfully muffled, and the vapor itself rendered invisible, so that horses pay no attention to the carriage.

The weight is 400 pounds, and the maximum speed on a good road is 18 to 20 miles an hour.

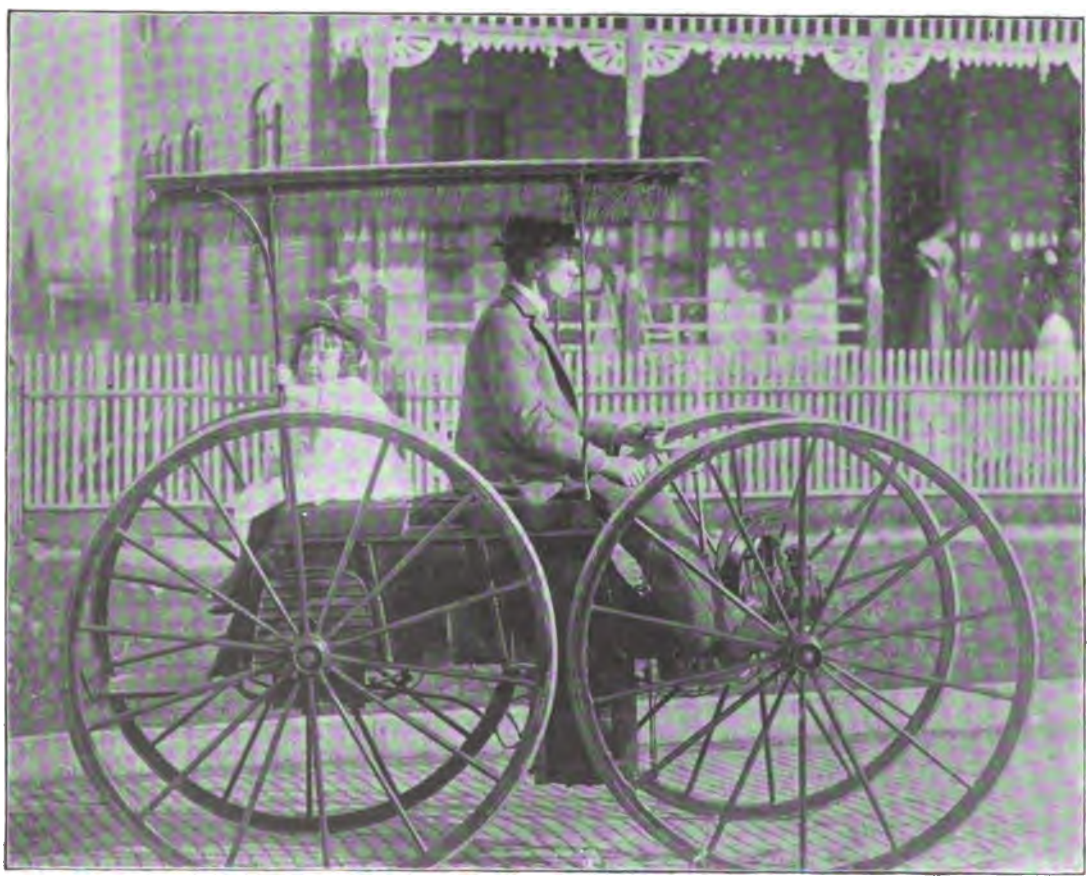
H. R. Bird's Second Carriage.

Citizens of Buffalo, N. Y., have recently been treated to the sight of the coming vehicle on their asphalted thoroughfares—the second vehicle constructed by H. R. Bird, of that city.

The first carriage, illustrated in our January issue, was built merely for experimental purposes, while the present one is handsomely finished throughout.

The motor uses kerosene for fuel, and power is transmitted by a friction device of Mr. Bird's own invention. Extra heavy iron tires are employed, instead of the rubber tires seen on most of the motor carriages.

A company will be organized in Buffalo to manufacture them.



STEAM CARRIAGE. JOHN EINIG, JACKSONVILLE, FLA.

MINOR MENTION.

The United States Seamless Tube Company, McKeesport, Pa., are reported about to erect a factory to build motor carriages at Christy Park, near that place.

The report that the F. P. Little Electrical Construction & Supply Company, Buffalo, N. Y., are contemplating the manufacture of vehicle motors and steel hubs for motor vehicles, is denied by that concern.

The Eastern Motor Carriage Company, New Haven, Conn., have had their experimental carriage out on the streets recently, and state that they are well pleased with its performance. After making a few minor changes they expect to begin manufacturing.

O. H. Perry, 31 Milk street, Boston, Mass , is building a motor carriage in which it is said he is to employ a new friction speed controller invented by H. H. Cummings, 110 High Street, same city.

William Homes, 164 Devonshire Street, Boston, Mass., has sold the Roper steam carriage described in our first issue.

The Pope Manufacturing Company expect to make an announcement in regard to motor carriages at the New York Cycle Show in February.

A. Burlingame & Co., Worcester, Mass., gave their experimental wagon a very severe test recently. The region about Worcester is very hilly, but after a run of 50 miles, in which the motor tackled the steepest inclines without flinching, the builders believe they have the foundation for a successful road wagon. The motor is of the gasolene type.

Hinsdale Smith, Springfield, Mass., is putting the finishing touches on his motor carriage. The body was built by the New Haven Carriage Company, and the transmission is of Mr. Smith's own design. The motor was furnished by the American Motor Company.

Joseph Barsaleaux, of Sandy Hill, N. Y., and L. B. Packard, of Salem, Mass., two purchasers of No. 1 American motors, have written the manufacturers that the motors are giving full satisfaction. Mr. Barsaleaux says that his buggy makes eight miles an hour on a level country road. Mr. Packard's vehicle has recently been on exhibition in a hall at Salem, where it was curiously viewed by his fellow townsmen.

The American Motor Company have, at their shop, in Hoboken, N. J., a nominal two-hp motor, giving 21 electric lights. Several improvements are seen in their later designs. They are doing away with joints in present models, and instead of being on the side the valves are now put on the top of the cylinder.

Recent Motor and Gas Engine Patents.

572,209. *Explosive Engine.*—Eduard E. Ludi, New York, N. Y. Filed Dec. 13, 1895. Serial No 572,063.

572,371. *Traction Motor.*—Hardy N. Revelle, Micajah M. Ford and Joe M. Kelley, Buchanan, Ga. Filed Sept. 1, 1894; renewed, Nov. 4, 1896. Serial No. 611,073.

572,449. *Electric, Steam and Gas Engine.*—Francis A. Rich, Telluride, Col. Filed May 9, 1896. Serial No. 590,904.

572,453. *Driving Gear for Motor Cars.*—Hermann Scnumm, Cologne, Germany, assignor to the Gas Motoren Fabrik-Deutz, Cologne-Deutz, Germany. Filed June 30, 1896. Serial No. 597,630.

572,498. *Motor Vehicle.*—Emil Capitaine, Leipsic, Germany, assignor to George T. Harris, Philadelphia, Pa. Filed Feb. 24, 1897. Serial No. 580,308.

572,593. *Power-Transmitting Gear.*— Finis M. Barney, Elm Creek, Neb. Filed Nov. 15, 1895. Serial No. 569,083.

572,681. *Roller Bearing.* Benjamin S. Lawson, Red Bank, N. J., assignor to the Roller Bearing Truck Co., New York, N. Y. Filed Sept. 27, 1895. Serial No. 563,822.

572,716. *Reversing Mechanism for Rotary Engines.*—William E. Prall, Jr., New York, N. Y. Filed April 8, 1896. Serial No. 586,675.

572,816. *Power-Transmitting Device.*—John S. Nichols, Edgerton, Minn. Filed April 28, 1896. Serial No. 589,406.

572,864. *Sprocket Chain Tightener.*—George H. Garver, Plano, Ill., assignor to the Plano Manufacturing Company, Chicago, Ill. Filed Feb 1. 1893. Serial No. 460,514.

573,010. *Motor Vehicle.*—Gotthold Langer, St. Louis, Mo. assignee of one-half to George W. Rarer, same place. Filed March 2, 1896. Serial No. 581,521.

573,184. *Motor or Engine.*—Stephen M. Balzer, New York, N. Y., assignee of one-half to William H. Humphrey, Norfolk, Conn. Filed Jan. 23, 1896. Serial No. 576,498.

573,209. *Gas Engine.*—Fitz E. Culver, Chicago, Ill. Filed June 20, 1896. Serial No. 596,275.

573,214. *Construction and Propulsion of Vehicles.*—John Gambetta, Stockton, Cal. Filed Dec. 30, 1895. Serial No. 573,811.

573,296. *Igniter for Gas Engines.*—Frank J. Rettig, North Manchester, Ind. Assignee to the Buckeye Manufacturing Co., Anderson Ind, Filed March 5, 1896. Serial No. 581,964.

573,322. *Valve Device for Gas Engines.*—Walter L. Crouch, New Brighton, Pa., assignor to the Pierce-Crouch Engine Company, same place. Filed Nov. 22, 1895. Serial No. 299,830.

573,334. *Wheeled Vehicle.*—Joseph J. Kulage, St. Louis, Mo. Filed Feb. 3, 1896. Serial No. 577,953.

573,628. *Gas or Vapor Engine.*—George S. Tiffany, High land Park, Ill,, assignor of one-half to Thomas S. Wheelwright, same place. Filed Oct. 2, 1895. Serial No. 564,386.

573,641. *Pump for Raising and Measuring Liquids.*—Emil Capitaine, Frankfort-on-the-Main, Germany, assignor to George T. Harris, Philadelphia, Pa. Filed May 22, 1896. Serial No. 592,590.

573,642. *Speed Regulator for Gas Engine.*—Emil Capitaine, Frankfort-on-the-Main, Germany, assignor to George T Harris, Philadelphia, Pa. Filed May 22, 1896. Serial No. 592,591.

573,762. *Gas Engine.*—John Charter, Jr., Sterling, Ill. Filed May 11, 1897. Serial No. 591,121.

Wheel for Vehicles; James S. Copeland, Hartford, Conn., assignor to the Pope Manufacturing Company, same place and Portland, Me. Filed Jan. 15, 1896. Serial No. 575,650.

514,200. *Motor and Wheel for Vehicles;* Charles F. Goddard, Chicago, Ill. Filed July 24. 1895. Serial No. 557,031.

574,262. *Motor Vehicle;* Edward J. Pennington, Cleveland, O., assignor to the Motor Cycle Company, Chicago, Ill. Filed Oct. 3, 1894. Serial No. 524,833. Patented in England Dec. 11, 1895, No. 23,771.

574,311. *Expansion Gas Engine;* John W. Eisenhuth, San Francisco, Cal. Filed Oct. 5, 1893. Renewed May 7, 1896. Serial No. 590,630.

"A Challenge to the World."

Such is the broad invitation which Mr. Pennington now publishes in an English contemporary. The precise terms of this last of a series of defis is given below for the edification of American readers:

I, E. J. Pennington, of the Motor Mills, Coventry, issue the following challenge to the world. It was my first intention, as announced a few weeks back, to challenge the makers of the winning vehicle in the Paris-Marseilles race, but from accidents and other causes several good carriages were unable to do their designers and makers full justice in that contest, so I have decided to to throw my challenge open to the world, as I desire to meet the best and most efficient autocars that have yet been produced. I therefore challenge any *bona-fide* makers of autocars in the world to a speed contest and mechanical trial against one of my machines under the following conditions, in which it will be seen that while speed is mentioned prominently, it is only one of 31 points of mechanical efficiency which I consider essential in the construction of a practical autocar:

On or before the 30th of October, 1896, each concern entering for the competition (who must be *bona-fide* builders of motor vehicles) and myself to deposit in Lloyd's Bank, Ltd., 72 Lombard Street, London, £1,000 sterling, subject to the order of the judges of the competition.

Upon the day of deposit they shall meet in the drawing room of the Hotel Metropole, London, at 11 a. m., when each competitor shall have one representative who will be empowered to select one well-known mechanical engineer as a judge. These judges shall have the power to select a third engineer to co-operate with them, and shall be paid each not more than £20 sterling per day while engaged on the tests.

DATE OF COMPETITION.

The judges as selected shall mutually agree upon a convenient time for a trial test and a date for starting the race, during the month of January, 1897.

LENGTH OF RACE.

The race shall be over a continuous course of 1,200 English miles.

PLACE OF COMPETITION.

The race to take place on a track at least one mile in circumference, or on a properly banked course, and to be within 100 miles of London, England, at a place to be selected by the Motor Car Club, London. This track to be so situated that the vehicles can be at all times in sight of the judges and spectators. Each competitor to tender to the judges at the place selected the autocar which is to enter the competition at least three clear days before the date on which it shall be decided that the trial test is to take place.

CLASSIFICATION.

The competing autocar to be a vehicle carrying not less than four persons.

DUTIES OF JUDGES AT TRIAL TESTS.

The judges shall carefully and thoroughly inspect, test and judge the autocars during the three days preceding the race on the following points:

1. Speed of autocar carrying four people.
2. Ascent of gradients.
3. Adaptability on rough roads.
4. Adaptability on soft roads.
5. Ease of operation of autocar.
6. Ease of steering.
7. Facility in turning sharp corners at high speed.
8. Maximum load for weight of autocar.
9. Minimum total weight of autocar for weight of people carried.
10. Minimum width of autocar.
11. Minimum height of autocar.
12. Compactness of autocar for stabling.
13. Minimum number of parts of autocar.
14. Minimum number of parts of motive power.
15. Minimum cost of operating autocar.
16. Quickness of starting autocar when motor is not in motion.
17. Autocar at standstill obtaining greatest speed in shortest time.
18. Quickness of stopping autocar.
19. Efficiency of brakes.
20. Minimum cost of operating engine.
21. Minimum amount of noise.
22. Quickness of stopping engine.
23. Motive power as affected by wind.
24. Motive power as affected by water.
25. Motive power as affected by mud.
26. In competition with oil motors, the minimum amount of odor.
27. In competition with oil motors, the largest range of grades of oil used without change in mechanism.
28. In competition with oil or steam motors, the minimum of heat radiated without extra covering.
29. In competition with oil motors, the minimum of vibration of motor power.
30. In competition with all engines, the minimum of space occupied by *motor attachments for power developed.*
31. *Minimum cost of manufacturing entire autocar.*

The judges shall keep a record of the points of each competing vehicle, as above outlined.

DUTIES OF JUDGES AT RACE.

The competing autocars, after having been put through the trial test by the judges, shall be started on the 1,200-mile race at such a time within period named as they may decide upon.

The judges shall have a record kept of the time of completion of the 1,200 miles by each of the competing autocars.

POINTS OF AWARD.

The competing autocar declared by the judges to have obtained the least number of points shall stand all costs of the tests, including rentals, pay of judges, etc., and this shall be paid by Lloyd's Bank, Ltd., 72 Lombard Street, London, on vouchers signed by the chairman of the judges, out of the £1,000 deposited by the owner or owners of the said autocar, the balance of the deposit to be tendered to the Lord Mayor of London for distribution among the charities of the city.

The owner or owners of the other autocars competing each to have the amount of their deposits refunded in full on vouchers signed by the chairman of the judges.

Gold Medal for the Duryea.

The Duryea Motor Wagon Company have received from the Motor Car Club, of London, a gold medal, in recognition of their splendid performance in the London-Brighton tour, on Nov. 14.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.
Price $3.00
Foreign 3.25

A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.
Price $1.00
Foreign countries 1.05

The Gas Engine. History and practical working. By Dugald Clerk. With 100 illustrations. New edition. 12mo., cloth.
Price $4.00
Foreign countries 4.25

Auto-Cars, Cars, Tramcars and Small Cars. By D. Farman. Translated from the French by L. Serraillier. Preface by Baron de L. de Nyevelt. 258 pages, 112 illustrations, 12mo., cloth.
Price $2.00

A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.
Price $6.50

IN PREPARATION.

Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.
Price ....
Foreign countries ....

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896,) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

A SUCCESSFUL INVENTOR AND DESIGNER of Gas, Gasolene and Kerosene Motors, for stationary and road purposes, desires a situation in which he can have a moderate salary and an interest in his inventions. Address "OHIO," care THE HORSELESS AGE.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

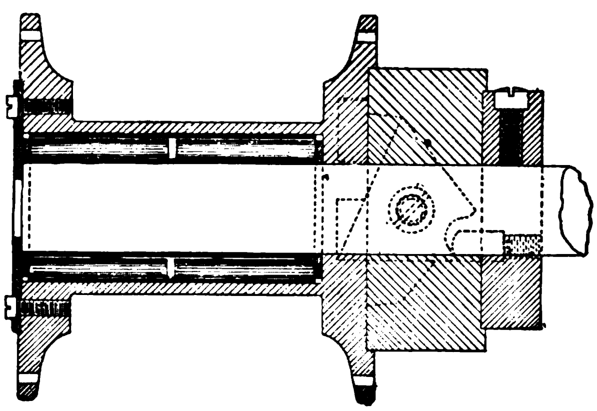
A Splendid Opportunity.

Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE, which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection with a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

WANTED.—To correspond with manufacturers who could undertake to build 50 gasolene or kerosene motors for driving ordinary 14-foot street cars, and a gasolene locomotive for light traffic on a 24-inch gauge line. Address N. ESCALANTE PEON, Box 8, Merida, Yucatan, Mexico.

Volume I, No. 1.

PARTIES having copies of the November, 1895, number of THE HORSELESS AGE, which they are willing to sell or exchange for later numbers, are requested to communicate with the publisher.



THE STEWART

AUTOMATIC CLUTCH.

The only thing ever invented that will regulate the wheels on a **Solid** axle when turning corners and work backwards as well as forwards. Parties building motor wagons or any other self-propelling vehicle, will find this preferable to the compensating gear on account of its neat appearance and small cost. Send for circular.

R. F. STEWART, Pocantico Hills, N.Y.

Motor Vehicles at the Salon du Cycle.

The annual Salon du Cycle, in the Palais de l'Industrie, is more than ever distinguished by its exhibit of motor vehicles of all kinds, a fact which has caused some little feeling of jealousy on the part of the cycle manufacturers, and will doubtless necessitate a separate motor exhibition in future.

Among the most attractive stands is that of Emile Mors, 48 Rue de Theatre, Paris, who shows two carriages, for two and four persons respectively, both propelled by gasolene motors.

The motor used on the larger of the two carriages is of particular interest. It is of six horse power and has four cylinders, standing in pairs at an inclination of 45 degrees, and thus almost eliminating vibration. By the use of radiating ribs so little water is required to cool the cylinders that a tankful will last for an entire day.

Electric ignition is employed, but the current is furnished by a small dynamo operated by a friction wheel in contact with the fly-wheel.

Leather belting is the form of transmission used.

The carburetor is a special one invented by M. Mors, and entirely automatic in action.

The motor is started by turning a crank in the rear, and a maximum speed of eighteen miles an hour may be attained.

Altogether this is one of the very best of the new Parisian models.

The Maison Parisenne des Voitures Automobiles, 71 Avenue de la Grande Armee, have several types of vehicles on exhibition, including a delivery wagon and a coupé with a glass front, permitting the vehicle to be controlled entirely from the inside. The Benz motor is employed by this firm, while the Roger, a motor somewhat resembling the Benz, is seen on the vehicles shown by the Anglo-French Motor Carriage Company, whose Paris depot is at 52 Rue des Dames.

The Compagnie Suisse des Voitures Automobiles, 33 Rue du Rhone, Geneva, Switzerland, show an omnibus drawn by a De Dion steam tractor. The omnibus carries twenty passengers, and is said to give good satisfaction.

A. Loyal, 204 Rue Saint Maur, exhibited a number of motor tricycles, in which the small two-cylinder, two-horse motor is placed between the two front wheels, the rear wheel acting as the drive-wheel. A carburetor and hot-tube ignition are employed, and radial ribs on the cylinders are substituted for the water jacket. As soon as the platinum burners are in a state of incandescence the burners may be extinguished and the tubes will be kept at a white heat by the explosions. Great speed is claimed for this tricycle, which weighs about 225 pounds.

The Fisson carriages, operating on the Benz system and transmitting power by belts, are shown by Maurice Roch Brault, 40 Avenue de la Grande Armee, Paris.

R. Cusset, 130 Rue du Bois, Levallois-Perret (Seine) has on exhibition a carriage propelled by a single-cylinder horizontal motor, in which the gases are compressed in a separate cylinder before entering the motor cylinder. This arrangement, it is claimed, makes a more powerful mixture and prevents premature explosions. As soon as the mixture is exploded a valve opens in the mixing cylinder and admits a new charge, which is then compressed. A speed of 2,000 revolutions is claimed for this motor, the explosions occurring with each revolution. In the transmission nothing noteworthy is seen.

The exhibit of the Gladiator Cycle Company is of special interest, because it comprises an electrical carriage propelled by Fulmen batteries, weighing 900 pounds and contained in cases in the front and rear of the vehicle. The motor is located on the rear axle, and the vehicle carries four persons. The steering is done with the rear wheels.

Gautiér, Wehrlé & Co., 31 Rue Caré, Levallois, and the Bollée Company show their usual lines, the only novelty in either case being light carriers adapted to transport merchandise of 200 pounds.

Landry & Beyroux, 19 Rue Albany, Paris, have on view a cab propelled by one of their vertical single cylinder motors. while M. Pretot, 42 Avenue Philippe Auguste, Paris, shows an ordinary four-wheeled cab having a detachable fore-carriage carrying all the driving mechanism, placed under the front part, and kept in position by a vertical rod, which is used also for steering. The motor, which is of five horse-power, is horizontal and works on a crank in front of the fore wheels to which it is geared by chains. The fore carriage can be attached and detached in a few minutes by removing a number of bolts.

The Pygmee motor of Leon Lefebvre, 4 Rue Commines, Paris, is exhibited on two vehicles, one a light pleasure carriage, and the other a delivery wagon, weighing over 3,000 pounds and adapted to carry over a ton. The Pygmee motor was described in the February issue of THE HORSELESS AGE.

Audibert, Lavirotte & Co., 12 Chemin des Quatre Maisons, Lyons, are represented by two carriages, one having a six-horse, the other a three-horse motor.

These motors are horizontal, and have single cylinders, Leather belting is used to convey the power to the intermediate shaft, and chains to carry it thence to the wheels.

De Dion, Bouton & Co. have the banner display in point of magnitude, showing eighteen petroleum bicycles as well as a number of their original steam tricycles.

The newest thing in the entire show was a carriage driven by a rotary steam motor, built by Nègre & Ruffin, 21 Avenue du Maine, Paris.

The Lutzmann carriage, applying power to only one of the hind wheels, was shown by the Société Internationale des Voitures Automobiles, 2 Rue Baudin, Paris.

Contest for Heavy Vehicles at Paris.

The Race Committee of the Automobile Club has issued the general regulations under which the international contest for heavy vehicles will be held on July 1, 1897.

The contest will take place somewhere in the neighborhood of Paris, and the competing vehicles will be divided into two general classes—omnibuses and delivery wagons.

Decision will be rendered mainly on the economy shown by the vehicles—that is, the cost of operation as compared with the weight transported.

In the first class competing vehicles must have a capacity of at least 10 passengers, with baggage estimated at about 70 pounds for each passenger.

Vehicles of the second class must have a capacity of at least a ton.

Vehicles intended for the transportation of both passengers and merchandise are required to have a minimum capacity of at least 2,250 pounds.

While any manufacturer will be allowed to enter more than one vehicle, the number of vehicles of the same type which he may enter will be limited.

An entrance fee of 200 francs will be charged for each vehicle, to be paid before June 1.

The lists will close positively on the 25th of June.

Photographs of all vehicles entered, together with prices of same, must be furnished the committee before June 25.

Arrangements for supplies needed during the contest can be made at places designated by the committee, but every vehicle must be capable of making nine miles without renewing supplies.

Six days will be required to complete the test, which will necessitate a total run of 180 miles, divided into six daily stages, or three different routes out and back. The vehicles will be so grouped that each day some will be passing both ways on each route, making frequent stops and carrying different kinds of merchandise.

Representatives of the Automobile Club will acccompany the vehicles and make note of various items of cost, time, etc., and report upon them.

Speed will be subordinate, a maximum being set by the committee, which all contestants will be required to obey.

Parks or stopping places will be provided as in the Paris-Marseilles race. Here all competing vehicles will be required to put up for the night, and all repairs must be made in the presence of the representatives of the club.

Medals will be awarded to vehicles which possess the requirements for either class of service, and a complete illustrated report of the test will be published by the club and given the widest circulation.

FOREIGN NOTES.

A company called the National Cycle & Motor Insurance Company, has been formed in London to cover this special field of accident insurance.

A subscriber of THE HORSELESS AGE, Stanislaw Grodzki, Warsaw, Polish Russia, is organizing a company to put a line of English motor 'buses in service there.

The Grand Duke Wladimir, General-in-Chief of the Russian army, is now in Paris studying the motor in its bearing on the transport of artillery and supplies in the field.

By the terms of the new English law, going into effect the 1st of January, motor vehicles weighing less than a ton are subject to an annual tax of $5 if used for private purposes, and $3.50 if used for public purposes. Vehicles weighing over a ton pay $25 and $19 respectively.

The total amount of prizes distributed by the Automobile Club to contestants in the Paris-Marseilles race was about $9,000 This includes over $1,000 expended for medals which were distributed among the conductors and mechanics having charge of the vehicles. The heaviest winners were Panhard & Levassor, who secured over $5,000.

On the 29th, 30th and 31st of January an international race for motor vehicles will be run between Marseilles and Nice. The course will be divided into three stages, the first of 78 miles, ending at Frejus; the second from Frejus to Nice, 40 miles, and the third from Nice to Monte Carlo, 18 miles. On the 1st and 2nd of February the vehicles will be sent back to Nice.

The Stanley Cycle Show of 1896, as compared with that of 1895, is an excellent indication of the progress that has been made in England the past year in the development of the motor vehicle This year a large section was set apart specially for the exhibit of the British Motor Syndicate, comprising motor tricycles of the Bollée, Gladiator and De Dion types, Panhard & Levassor carriages, omnibuses and vans, and the most successful of the electrical vehicles thus far built in England.

The Rawhide Chain

Frederick W. Barker, a patent attorney having offices at 253 Broadway, New York, has secured patents on a rawhide chain for vehicles and general transmission use.

In this chain the centre blocks are composed of rawhide flanked by metallic reinforce plates. The rawhide serving as the major pivotal bearing for the pins it is claimed that the frictional contact is reduced to a minimum and that no lubrication is required.

The rawhide projects slightly beyond its flanking plates at the ends, and thus receives the impact of the sprocket teeth, entirely obviating the clicking or rattle which occurs when ordinary metal blocks are used, and rendering the chain noiseless in its operation. The merit of cleanliness is also claimed for it, as no graphite need be applied to collect dust or mud.

We are informed by the inventor that thorough tests of this chain have been made by bicycle experts under all conditions of road and weather, with most satisfactory results, and that it will soon be placed on the market in all sizes adapted for bicycles and motor vehicles.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, JANUARY, 1897. No. 3.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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The Oil Famine Bugaboo.

IN his very interesting lecture on motor vehicles, delivered recently before the Automobile Club of France, M. Marcel Desprez, member of the Institute, presented a decidedly novel objection to the petroleum road motor. The learned gentleman is haunted by the fear that if this fuel comes into general use for vehicle propulsion, we shall sooner or later be brought face to face with an oil famine, because only 8,000,000 tons of oil are annually taken from the earth, while 400,000,000 tons of coal are annually mined.

In his desire to force steam to the front as a motive power for road vehicles, M. Desprez has borrowed a great deal of unnecessary trouble from the future. If we grant that his figures are correct, and that the annual production of coal in tons is now fifty times as great as that of oil, there is still something to be said about the relative value of the two as fuels. Moreover, coal mining is a much older industry than the oil industry, and the production of oil is now increasing as its uses multiply. Under the stimulus of a great demand from a vast and newly created industry we may expect that new fields will be discovered and improved methods of raising the liquid be introduced, so that in the present generation, at least, an oil famine seems impossible.

But, if in the distant future, the natural sources of the hydro-carbon should become exhausted, artificial means may very likely be resorted to to meet the wants of civilization. Synthetic chemistry is daily adding to its triumphs, and it is difficult now to set a limit to its possibilities. The great needs of civilization are quite certain to be supplied as they arise, and as to future generations we can safely trust them to settle their own difficulties and satisfy their own wants.

Seven-Million-Dollar Rotary Engine.

THE daily newspapers appear to be vieing with each other to see which can tell the most preposterous stories about motors and motor vehicles. Perhaps the choicest bit of newspaper imagination that has recently served to enliven a period of dullness is the story of Grant Bramble, of Sleepy Eye, Minn., and his marvelous rotary steam engine, for which an English syndicate is said to have paid the modest sum of $6,700,000, one-quarter of which has already been received by the inventor.

We are informed that Millionaire Bramble, not-

withstanding his stroke of fortune, is still living at Sleepy Eye, in his humble, vine-clad cottage, the sole support of a widowed mother, and the only expert telegraph operator in town.

In the last statement lies the key to the whole story. Mr. Grant Bramble, being the local station agent and telegraph operator, had the wires at his disposal and used them so effectually for his purpose that Sleepy Eye is now the best advertised town of its size in Minnesota. If Mr. Grant Bramble can sell the patent on his rotary engine for enough to pay his fare to Europe he should dispose of it at once, and go to London and offer his services to the British Motor Syndicate.

The "Tug of War."

PROMOTERS of the motor vehicle in England have a new amusement. They call it the "tug of war," and it consists in hitching two vehicles together back to back, starting the motors and seeing which can pull the other. Judging from the large amount of space given to this subject in our English contemporary, the *Autocar*, this feat seems to be regarded as conclusive proof of the superiority of a vehicle. We are informed that the Pennington machine on one occasion pulled the Bolleé some distance in a tug of war, and that the Pennington is therefore a better machine and can outrun the Bolleé any day for a consideration of £1,000, to be given by the victor to some charitable organization. These terms the backers of the Bolleé are not inclined to accept, and so the merry war of words goes on, and if England is not full of sporting events in the motor line this Winter it is not for lack of brag and bluster.

Meantime it is but just to say that the Bolleé machine has at least made for itself a creditable record on the road, and that no affidavits are necessary to establish the fact.

The Danger Signal.

WE call attention to the correspondence published on another page in regard to the kind of danger signal or alarm that should be adopted for the motor carriage. Quite a number of inventors with whom the editor has talked recommend the vibrating bell. Others hesitate between this and the horn. Some few prefer the whistle. The discussion is open, and it is desirable that all opinions should be heard in order that the proper alarm may be selected for the motor carriage.

The Electric Vehicle Discussed.

At a meeting of the American Institute of Electrical Engineers, held January 20th, at No. 12 West Thirty-first Street, New York, the topic of discussion was "Electrically-Driven Vehicles."

The discussion was opened by A. L. Riker, of the Riker Electric Motor Co., Brooklyn, N. Y., who presented a paper, as follows:

Mr. Chairman and Gentlemen: In opening a discussion on electrically driven vehicles, at this time, I feel as if the electric carriage had arrived at a period of transition, that it is passing from the experimental into the practical stage. I think that it is generally admitted that the electric carriage is the ideal vehicle, having all the advantages of simplicity. being easy to control, and free from heat, vibration, or odor, but there is one element in the electric vehicle that we must not lose sight of, and which has caused all experimenters in this line their greatest trials—that is, the storage battery.

This vital part of the system has been defective, and on the remedy of this defect depends the success of the electric vehicle. This defect is not that the storage battery is not a practical apparatus, but that it has not been adapted to the particular requirements in this case.

The weight of a motor vehicle must be kept within certain limits. To that end the battery portion has had to be lightened and under the same conditions it has had to withstand heavy discharges from 100 per cent. to 1,000 per cent. above the normal rate. To meet these requirements some special form of cell must be devised.

I have corresponded with most of the prominent battery companies both on this side and abroad and find the best output obtainable for complete cell. including hard rubber jar, acid and element, sealed in, is about 5¼ watt hours per pound. This value limits the run from four to five hours on each charge at a ten-mile rate.

If there is present any representatives of the storage battery interests I should be glad to hear whether they have anything new for this service. I had hoped to be able to give the results of a complete set of tests on a new vehicle upon which I am now engaged, but the carriage is not finished.

My experience with my first two carriages, both of which were supplied with a double motor equipment, has shown that a single motor is preferable. The single motor equipment is much more sightly, and the motor and gears can be placed under the middle of the body and out of sight. The bicycle construction, wire spokes, pneumatic tires, and tubular gear I believe are necessary to a successful vehicle. Equally necessary, if the vehicle is to give satisfaction, is simplicity of control.

At the present time the electric carriage is not eminently suited for long runs or out-of-town service, but for this service we anxiously await what the future may bring forth.

The chairman of the society then commented briefly on Mr. Riker's paper. He said that when electrical engineers could construct a vehicle which would go 35 miles in one day they would then enter the commercial field. So far as he knew there were no storage batteries in the market now that would average better than 20 miles on one charge, and when the battery is drawn upon until near the point of exhaustion the deterioration is much more rapid. He had yet to learn of a battery of high efficiency and low depreciation, which was the type required for the work.

The discussion was then thrown open, and several engineers who had had experience with storage batteries spoke rather skeptically of its availability for road traction. One of the speakers said that in experimenting with storage batteries for track locomotion, he had found that when the track was in prime condition 40 miles could be made on one charge, but when it was in poor condition only 10 miles could be made. He would advise any one taking a ride in an electric vehicle, to have a meter along with him to tell him when to turn about and come home.

A gentlemen then rose and said that several builders of electric vehicles were using meters such as were suggested indicating the amount of current which had been used and the amount left.

A representative of the Electric Carriage & Wagon Co., being called upon to contribute to the discussion, spoke of the familiar "Electrobat," which he said would make 35 miles on one charge and had been run 1,000 miles without accident.

The hansoms which this company are now building for public service in New York have already been described in THE HORSELESS AGE. These, he stated, would not be ready to test for several weeks.

Charles E. Duryea, of the Duryea Motor Wagon Co., manufacturers of gasolene vehicles, was noticed in the audience by the chair, and was invited to speak in behalf of the vehicle which he represents.

He disagreed with Mr. Riker in regard to the placing of the motor on the truck or axle, believing the body of the vehicle to be the proper place for it on account of the vibration to which the machinery of the motor vehicle is subjected close to the ground.

The odor of the gasolene vehicle he thought less disagreeable than that of a horse, behind which we now ride, while we ride in front of the gasolene motor.

He spoke against the automatic features which Mr. Riker said he would introduce into his new vehicle, contending that it was much better to have the machine under the complete control of the operator. Automatic steam engines for marine use he had found unsatisfactory.

One great disadvantage of the electric vehicle was the limited run it could make on one charge. A half hour or an hour's run was easy, but something more is demanded now. He instanced the long runs people make on bicycles for pleasure, and the exhilaration attending a lively cross country run in a motor vehicle, and said that while the owner of a motor carriage would not care to travel 50 or 100 miles every day, still he would not be satisfied unless he could go this distance when he chose. Speed is the desideratum, and to attain this light weight is necessary.

Of the Serpollet steam wagon, favorably mentioned by one speaker, he said it cost twice as much to get power out of it as out of a gasolene wagon. Another great obstacle to the use of the electric vehicle, he thought, was the length of time required in charging.

In closing the electric side of the discussion Mr. Riker called attention to experience in electric street railway engineering, which had resulted in the placing of the motor directly on the axle, after nearly every conceivable position had been tried. The vibration referred to by Mr. Duryea, he thought, was minimized by the pneumatic tire.

As an encouraging sign in storage battery development he said he had lately been experimenting with a storage cell, which he had charged at high rate in three and one-half hours and discharged in two hours, with an efficiency of 65 per cent. Batteries could easily be changed if long distances were to be traveled, the discharged cells being replaced by fresh cells. Mr. Riker said he was trying various devices to save power, one of which was similar to the back gear on a lathe, so that when snow is encountered speed will be reduced and more power obtained. A meter, which he is adopting, indicates how much current is required to bring the battery up to its standard of energy, preventing overcharging.

Being asked what was the difference in power required for asphalt pavement and dirt road, he said that Belgian block and asphalt pavements required about the same amount of power, while good macadam took a little more.

Ralph W. Pope, secretary of the Institute, closed the meeting with a brief résumé of the arguments and facts presented, expressing the hope that in the future, when the enormous storehouses of electricity found in the waterfalls, the rivers and the tides had been utilized and distributed, the electric vehicle would become the road vehicle *par excellence.*

Electric Hansoms Now for Hire.

The Electric Carriage & Wagon Co., New York and Philadelphia, have opened headquarters at 140 West Thirty-ninth street, New York, where they will have at public call a number of electric hansoms, such as were illustrated and described in the September issue of THE HORSELESS AGE. They will advertise constantly in the local papers, and hope within two or three months to keep a dozen vehicles busy. This number will then be increased as required.

The Gas Exposition.

One of the chief features of the Gas Exposition held Jan. 25 to 30 at Madison Square Garden, New York, was the exhibit of the American Motor Company, comprising two elegant phosphor-bronze 2-hp vertical motors, a 4-hp horizontal stationary motor and a small vertical motor having the valves on top of the cylinder to do away with joints.

The Pennsylvania Iron Works showed a launch propelled by a "Globe" gas engine.

Largest Motor Boat Ever Built in the United States.

The Daimler Motor Company, Steinway, Long Island, have just taken an order for the largest motor boat ever constructed in the United States.

The boat, which was ordered by a New Yorker and is to be delivered next May, is 80 feet in length and is equipped with two 20-hp Daimler motors. It has twin screws; trunk cabin, dining room and social hall on the main deck; forward saloon, grand saloon, all finished in mahogany, and owner's stateroom in white and gold.

Though built for cruising purposes it is guaranteed to make 12 to 14 miles an hour.

The Daimler Company also have in hand several orders for large boats from 64 to 76 feet in length.

New French Motors.

The new motor of Panhard & Levassor, called the Phœnix, differs in several important features from the Daimler, which this firm has manufactured under a royalty for some years.

In the Daimler motor the two cylinders are placed transversely to the vehicle, each cylinder being inclined from the vertical at an angle of 15 degrees. In the Phœnix the two cylinders *A A'* are vertical and are placed lengthwise of the vehicle, as shown in Figs. 1 and 2, figure 1 representing the front of a Panhard & Levassor vehicle of the latest type, with all protecting covers removed.

In the Daimler the exhaust valves were operated by two guide rods which received their motion from a friction roller located in the grooves of the fly-wheel. In the Phœnix the shaft *B* is prolonged, and by means of a pinion, *C*, geared 1 to 2, operates a lateral shaft, *D*, having two cams, *E E'*, which, at the desired moment, raise the valve rods, *S S'*.

This lateral shaft extends the whole length of the motor upon the opposite side from that represented in Fig. 2, and carries besides the cams a ferrule *F*, upon which the governor acts, mounted upon the same shaft *D*. This ferrule is cylindrical in form to accommodate itself to a cam at *f*.

When the motor exceeds the normal speed the governor draws the ferrule forward and the hammer *R*, actuated by a spring *r*, strikes upon the eccentric part *f*, instead of upon the cylindrical part *F*. In consequence of the play of the lever *R O P*, the rod *P p* is pushed into the centre, which produces two different results, according as it is *P p* acting upon the rod *S*, controlling the valve of the cylinder *A*, or the rod *P' p'* acting on the rod *S'*, which controls the valve of the second cylinder *A'*.

The joint *P*, of the rod *P p*, is elongated so that the push of the lever *R O P* loses itself in the joint and does not reach the rod *S*, which remains fast in *P*. The joint *P'*, however, has no play, so that the point *p'* receives the same push as the end *P'* of the lever *R O P*. This has the effect of throwing the rod *S'* out of *T'*, so that the valve is not raised, the gas does not escape, and the cylinder *A'* ceasing to work, the motor slows down.

When the adjustment is complete the ferrule *F* resumes its normal position, the hammer *R* again falls upon the cylindrical part, and the rod *S'* being raised again, the cylinder *A'* commences to operate once more.

In the Phœnix as in the Daimler the mixture is prepared in a carburettor *G*, according to the Daimler method, the essence being supplied to the carburettor by the pipe *i*, leading from the petroleum reservoir *I*, behind the dashboard of the carriage.

Ignition is effected by platinum tubes kept at incandescence by means of round hollow burners of copper gauze, supplied with fluid by the tube *j*, which descends from the auxiliary reservoir *J*, the whole being enclosed in a protecting shield of tin *H*.

The descending impulse of one of the pistons coincides with the descending exhaust stroke of the other. Only one crank shaft is used, and a working stroke is obtained every revolution.

The weight of the 4½-hp motor is less than 200 pounds. All its mechanism is easily accessible, particularly the valves, which must be absolutely tight if the motor is to do its work well. To reach the valves one need but unfasten the bolt *M* an operation requiring only four minutes.

Water for cooling the cylinders is kept in circulation by a

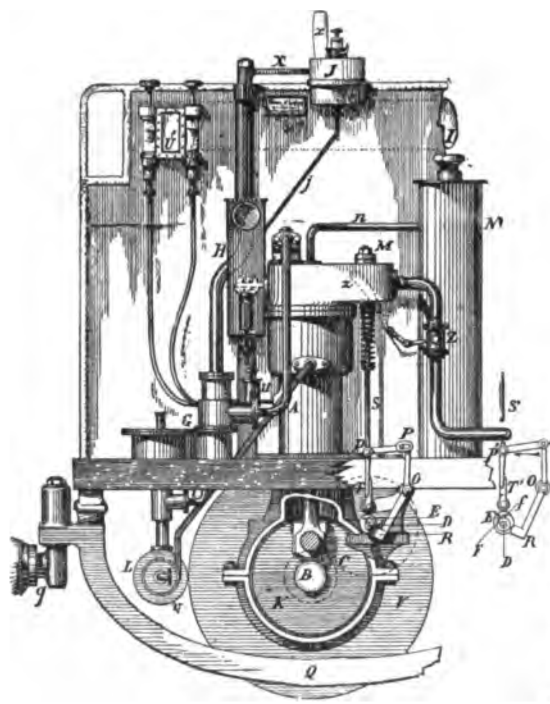


Fig. 1.

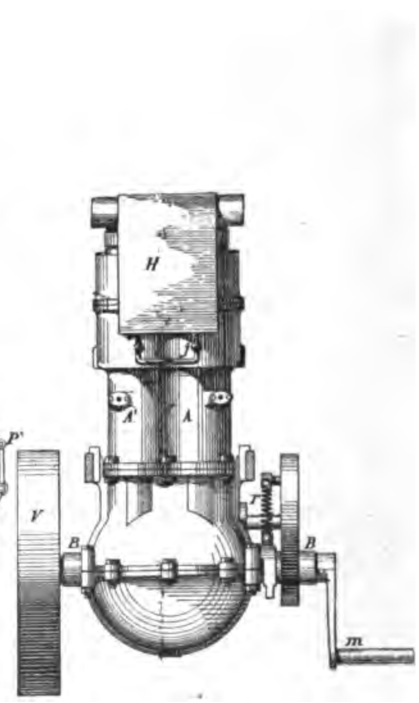


Fig. 2.

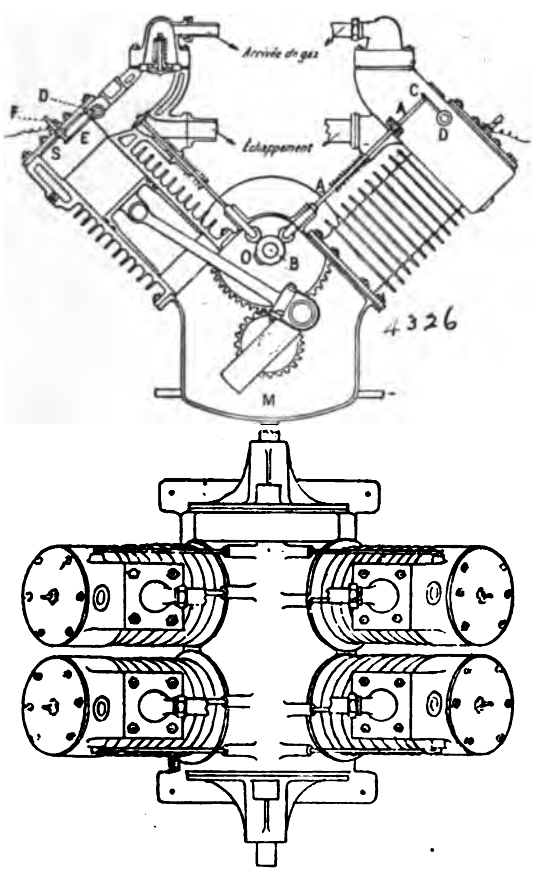
PHŒNIX MOTOR, PANHARD & LEVASSOR.

l centrifugal pump L, operated by a friction roller r the side of the fly-wheel of the motor.
›tion is also communicated to the vehicle mechanism by fly-wheel, which is the active part of a friction-clutch ıanism. The water which goes to the upper part of the ders A and A' passes immediately through the pipe n a condensing chamber N, from which it returns to the r-tank in the rear of the vehicle.
e cylinders are lubricated by the double lubricator U two feed-pipes u and u', which also introduce into the ders a small quantity of oil to facilitate starting the r, when the crank m is turned.
the machinery is placed in front of the carriage and on springs, which are supported by the curved axle Q, ıg at its two extremities in the pivots q and q', operated e steering lever X.
valve located in a box Z upon the exhaust pipe and cond by a small lever z on the opposite side of the seat, les the conductor to regulate the speed of the motor acng to the resistance offered to the pressure of the exhaust.
ahard & Levassor are building Phœnix motors of 6, 8 and rse-power. The six-hp motor is obtained by an increase diameter of the cylinders and the stroke of the pistons; ght horse-power by the use of four cylinders, and the 12 -power by coupling together two six-hp motors.
e carriage of M. Mors is propelled by a petroleum motor, ıg four cylinders arranged in pairs and inclined at 45 degrees to each other. The motor shaft carries two cranks at an angle of 180 degrees.

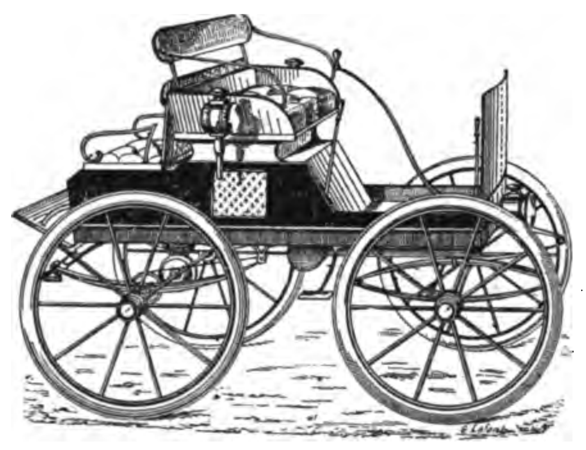
The exhaust valves are operated by means of a shaft revolving at half the speed of the main shaft. The inlet valves act simply by the difference of pressure.

The method of ignition is as follows:

The rods A, actuated by the counter-shaft B, press upon the armature C at the end of the axis D, passing through the cylinder. Inside the cylinder is another armature E acting upon the insulated rod F in communication with one of the poles of a battery, the other pole being in contact with the frame of the machine. If the armature E is moved from the rod F by the rod A, which is actuated by a cam O, a spark is produced at S, and an explosion follows. The electricity being employed at low-tension insulation is of less consequence than when the induction coil is used. The batteries are kept charged through a dynamo operated by the motor.



THE MORS MOTOR.



THE MIGNONETTE.

Cooling of the cylinders is effected partly by radiating ribs and partly by water.

Constant lubrication is assured as the cranks dip at every revolution in a bath of oil, contained in the chamber M.

Vibration is said to be practically done away with, and when the carriage stops the speed of the motor can be greatly reduced by means of checks, which limit the supply of air to the cylinders.

The total weight of the Mors vehicle is about 1,000 pounds, and its maximum speed on a level is 18 miles per hour.

Gautier, Wehrlé & Co. contribute to the list of motor novelties a carriage called the *Mignonette*, weighing only about 800 pounds and resting on pneumatic tires.

Its motor is a two-cylinder horizontal motor of the Otto type, placed transversely in the most solid portion of the vehicle frame, in order to subdue vibration. All the mechanism of the motor is protected from mud and dust, and all bearing parts are automatically lubricated. Transmission is effected with cut chains or belts through a system of gears, also enclosed and running in oil to prevent noise and grinding. Outside of the case or box is one toothed pinion only, which drives the rear axle, carrying the compensating gear. This axle allows full play to the springs, and yet gives to the wheels the freedom usual in vehicles.

Ignition is electric.

Three different speeds are possible, the maximum being about 15 miles an hour.

The new motor of Armand Peugeot, of the Société Anonymé des Automobiles Peugeot, Mandeure (Doubs) France, which was used for the first time in the Paris-Marseilles race, has two horizontal parallel cylinders, shown in *C*, *c* being the igniting device. The motor shaft *A*, parallel with the axles of the vehicle, carries the fly wheel *V*, in which engages a friction clutch, which by means of a gear drives the intermediat shaft *a*, also parallel with the axles. This arrangement does away with the longitudinal shaft and mitre gear, which was found necessary with the Daimler motor, owing to the fact that it was placed in front and transversely to the vehicle.

The gears furnishing the different speeds are arranged upon the shaft *a*, and upon the pinion shaft *p*, carrying the differential *D*. These pinions *p* communicate motion by means of chains to two toothed wheels *P*, that drive the hind wheels *R*.

Steering by the forward wheels is accomplished through a two handled lever, *f*, acting by a chain upon the axis *O*, which through the rods *b* and *b'*, moves the pivots of wheels *F*.

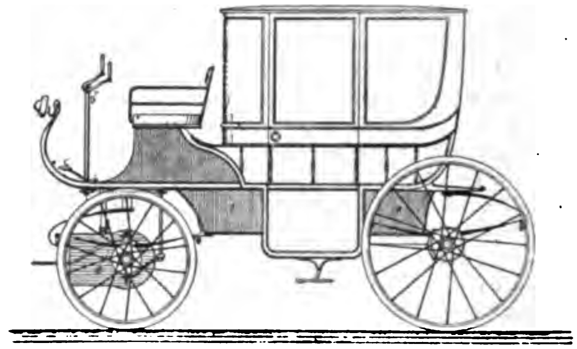
A lever, *L*, in the different positions, brings the speed gears in and out of engagement. These changes in speed are effected by imparting to the spiral groove *l* certain rotary movements, displacing clutches, which in turn act upon the hubs of the series of gears, sliding upon the shaft *a*.

One position of this groove *l* brings into gear an auxiliary pinion, which interposed as a third, between the two wheels, fixed one upon the shaft *a*, the other upon the shaft *p*, changes the direction of rotation of the latter, and backs the vehicle.

The water tank for cooling the cylinders is placed in the rear at *E*, and that containing the fuel at *G* under the forward seat.

A brake lever *h* acts upon two pulleys *H* fixed upon each of he wheels *R*, and another pulley *N*, fixed upon the differential shaft, is braked by the action of a pedal.

The whole mechanism is entirely closed in, so that there is no danger of its being interfered with by the mud or dust. The water for cooling the cylinders is carried in the tubes forming the framework of the vehicle, and circulates around in a chamber with numerous flanges, which agitate the water and thus facilitate the cooling. The makers claim that the motor will run for a much longer period without water than any other type. In the Paris-Marseilles race their vehicles ran for 220 miles without its being necessary to use the pump, and on the last two days they claim the water was not used at all. The motor is geared for four speeds, and the change is effected by a single lever, which also serves to start and reverse the mechanism. The weight has also been greatly reduced, and the six horsepower motor does not weigh more than 250 pounds, including the carburetor. Experiments are still being carried on with the gearing, and in the light vehicles this will be effected by friction and leather belting. Several other notable improvements are also to be effected, notably in the carburetor, in which the mixture will be kept at a constant level, thus avoiding the overflow and other difficulties that often result in a stoppage of the vehicle.



ELECTRIC CARRIAGE OF M. JEANTAUD.

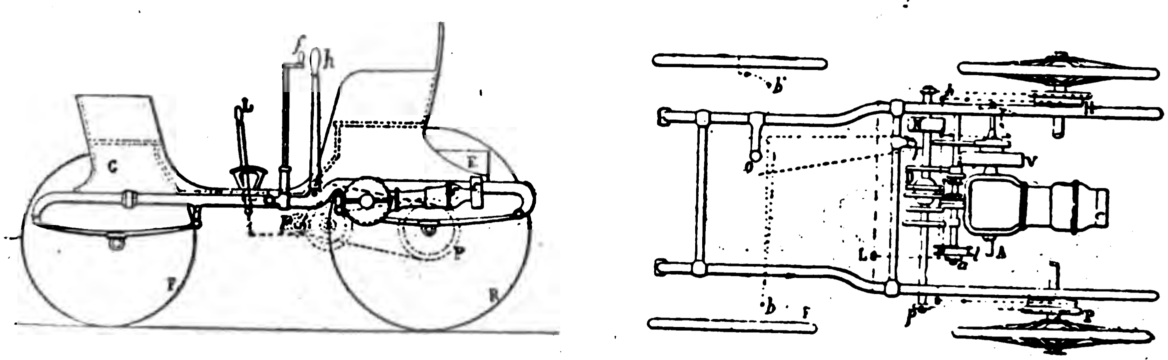
One of the best electric vehicles recently produced in France is that of M. Jeantaud. It is a closed carriage, seating four besides the conductor. The body of the vehicle, which is of sheet aluminum, rests upon a steel frame, which holds the batteries.

The mechanism is reduced to two sets of steel gears, working in oil, and connecting the motor and the forward axle, which is also the steering axle. The weight of the entire vehicle, ready for the road, is about 2,300 pounds.

The batteries, which are of the Fulmen type, have a capacity of 30 ampere hours to the kilogram at low discharge. Over a level road it is claimed a journey of 60 miles can be accomplished on one charge, and on ordinary country roads 36 miles.

The entire control is effected by a small handle turning around a quadrant.

Messrs. Kellner et ses Fils, 125 Avenue Malakoff, Paris, are now showing a very handsome motor carriage, designed to carry three persons and propelled by a 3½-hp horizontal motor having two cylinders and making 600 revolutions per minute. Transmission is by belt and pulley, and three speeds up to a maximum of 15 miles an hour can be obtained. No crank need be turned to start the motor, the electric current being sufficient to do this as soon as it is put in operation, hence the motor need not be left running when temporary stops are made. The total weight of the machinery is said to be a little less than 300 pounds.



NEW CARRIAGE OF ARMAND PEUGEOT.

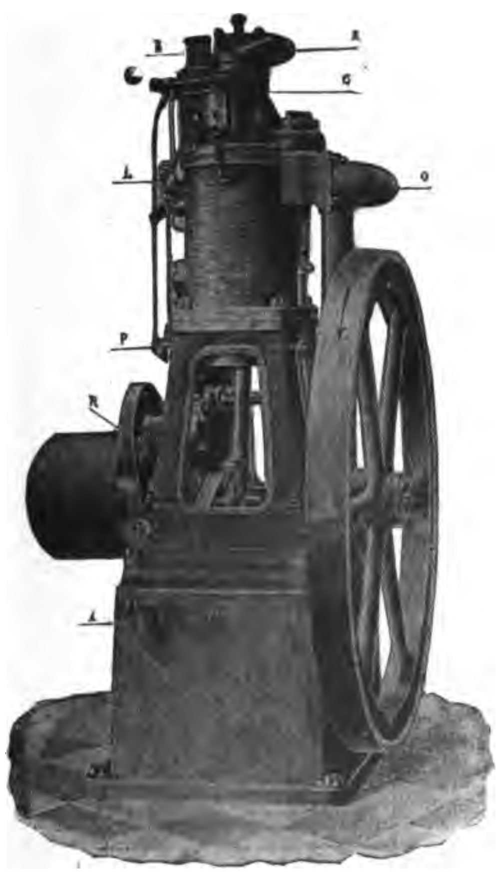
The Capitaine Motor.

Emil Capitaine, Frankfort-on-the-Main, Germany, is now taking out, in this and other countries, quite a number of patents, in gas motors and their application to the propulsion of vehicles.

The stationary motor which we illustrate here, runs on the Otto cycle and has one vertical cylinder on top of which is the combustion chamber, *C*, supplied with air through the admission valve *W*. *V* is the vaporizer, somewhat cone-shaped and provided with outer radiating ribs. At the left of the vaporizer is a valve, *N*, retained upon its seat by a spring. The vaporizer serves the double purpose of volatilizing the petroleum and igniting the compressed charge.

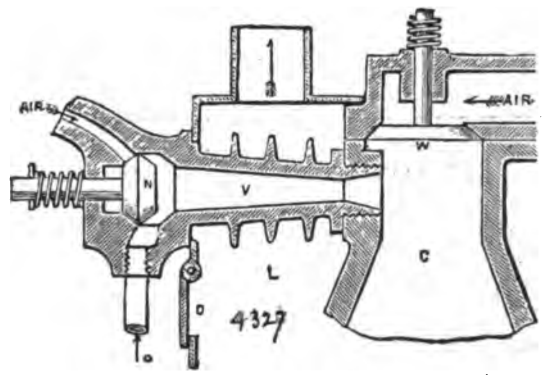
When the vaporizer has been raised to the proper temperature, this temperature is maintained by the heat of the explosions and by a ventilator *L*.

The petroleum is injected by means of a small feed pump *P*, mounted upon a pipe *O*, which has its outlet in front of the valve *N*.



When the piston descends air is drawn into the cylinder through the valve *W*. At the same time a quantity of air is admitted into the vaporizer through a passage opened by the valve *N*. This air instantly mixes with the petroleum introduced by the pump *O*.

The valves are so arranged that the petroleum is injected a little before the inlet is opened, hence at the close of the period



VAPORIZER.

of admission the cylinder contains a mixture poor at the tod but rich as we approach the piston.

During the period of compression the stratification of the mixture is not appreciably affected, hence the rich and inflammable portion is not fired until it reaches the vaporizer, whose walls are kept at a high temperature. But inasmuch as the vaporizer is cooled by the air from the exhaust, premature explosion is said to be impossible.

The exhaust valve opens every second turn of the fly-wheel, being operated by an oscillating mechanism controlled by a make and break device and also operating the feed pump. The feed regulation is very sensitive, proportioning the oil to the work done through control of the number and not the force of the explosions.

Catalogues of Foreign Manufacturers.

Catalogues have recently been received by the editor from F. Lutzmann, Dessau, Germany; Leon Lefebvre, Paris, France, and the Compagnie Generale des Automobiles of the same city. The Lutzmann vehicles are propelled by Benz motors, but the power is applied to only one of the hind wheels. M. Lefebvre is the manufacturer of the "Pygmeé" motors considerably used in France for both vehicles and boats. The Compagnie Generale manufactures the Triouleyre carriages, which also employ the Benz motor, but embody improvements in transmission and other details.

Two French Opinions.

The Baron de Zuylen de Nyevelt, president of the Automobile Club, is a believer in the electric vehicle for city use. Even in the present state of the art he claims for the electric carriage a saving of 40 per cent. over animal traction. For heavy trucks and omnibuses he advocates steam. He states, however, that in his opinion the field is so vast as to give ample room for all kinds of motors.

Victor Popp, the Paris engineer, who has been so successful in the use of compressed air for traction, advocates compressed air and steam for road vehicles. His experience with storage batteries has not been satisfactory, owing to their rapid deterioration, even under the most favorable circumstances.

"Twin" New York Motor.

The New York Motor Co., 11 Murray Street, have in operation at their factory a "twin" motor, or two motors like that already illustrated in THE HORSELESS AGE, working on one shaft. This form of construction they regard as highly economical, warranting the use of a smaller fly-wheel and lessening vibration at least one-half in proportion to the power developed, which in this case is claimed to be fully four horse.

They are prepared to gear up four or even eight of these motors in this manner, if desired.

In order to obviate all possibility of explosion in the carburetor, they now provide it with a chimney which has a diaphragm top, so that in case a back explosion occurs and the flame reaches the carburetor, it simply passes up the chimney and quickly finds a vent. But to make assurance doubly sure a flame arrester is inserted between the inlet valve and the carburetor, and a check valve also turns back the flame.

Boston's Self-Propelling Fire Engine.

The Amoskeag Works, at Manchester, N. H., are constructing a large self-propelling steam fire engine for the City of Boston, Mass.

The great height of modern office buildings renders it impossible to throw a stream of water to the top stories with ordinary fire engines such as are drawn by horses. Increased power means increased weight, and horses would not be able to handle an engine that would do this work. Hence the Fire Commissioners of Boston were compelled to order this monster self-propeller.

The engine will be 10 feet in height, 16 feet 6 inches in length, 7 feet 3 inches in width, and is expected to throw 1,800 gallons of water a minute and to project a two-inch stream over 300 feet into the air.

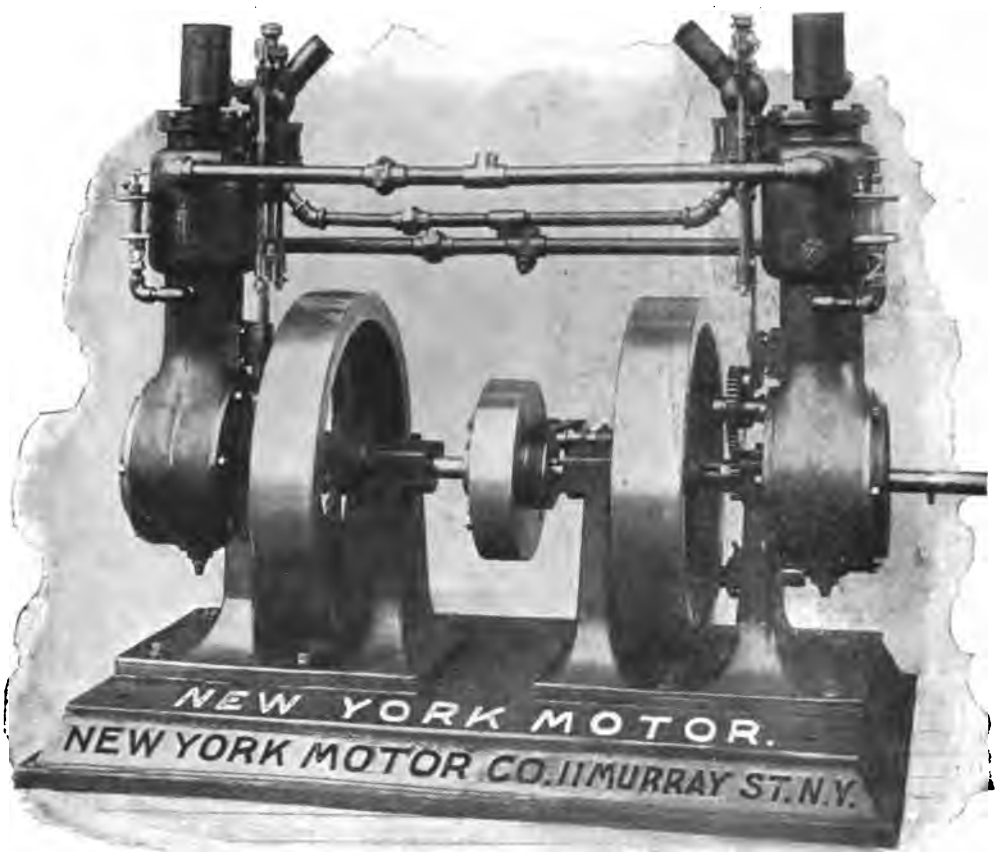
The transmission of power is by sprocket and chain, and an equalizing gear enables the wheels to turn independently in rounding corners.

When the power is to be used for pumping, the removal of a key disconnects the driving gear instantly. An extra water tank to supply the boiler is carried at the rear.

Two engineers are required to handle the machine. The chief engineer rides on the fire box, and has directly under his hand the levers and wheels which start, stop and regulate the speed of the machine. The assistant engineer rides on the driver's seat, on the front of the machine. Directly before him is a tiller, the shaft of which passes down through the footboard and is firmly bolted through the front axle. By means of this the driver steers the machine in exactly the same manner as the rear wheels of the long ladder trucks are governed.

The City of Boston has had previous experience with self-propelling fire engines. The late S. H. Roper built one for the municipality some years ago, which is said to have been quite successful in practice; but the horseless age had not arrived then, and the matter was dropped until the present time.

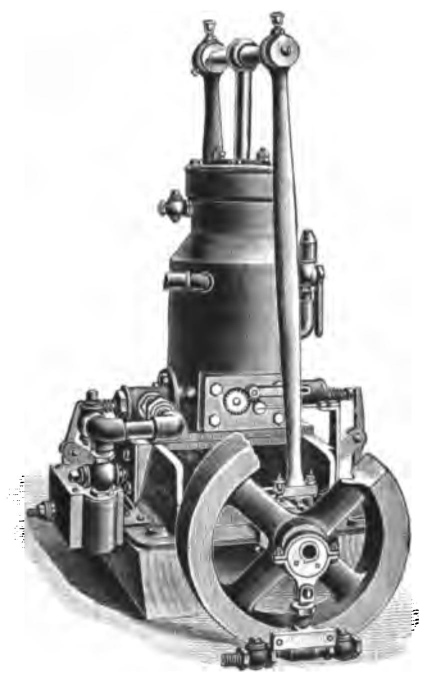
The City of Hartford, Conn., now has in service a self-propelling fire engine, which is regarded as much more efficient than those drawn by horses.



Wing's Marine Gas Motor.

L. J. Wing & Co., 109 Liberty Street, New York, are now placing on the market a marine gas motor, which is the result of many years of practical experience in this branch of engineering.

The motor is of the class taking an impulse every second revolution, but the construction and action are radically different from all other motors, as can be seen by examining the illustration. The gases are admitted into the lower part of the cylinder, giving an upward impulse to the piston, thus largely doing away with the heavy thump or jar of other gas motors that have the down stroke acting directly on the frame and planking of the boat. This arrangement allows a rigid piston rod and very long connecting rods, giving but a very slight angle, and making a pulling instead of a pushing strain on the connecting rods.



The weight is all low down near the keel—a very valuable feature—and every bearing is on the outside and accessible. One oil cup, requiring only about one drop a minute, lubricates the cylinder, piston and piston rod.

The gas in the cylinder is ignited by an electric spark, obtained from a pair of wiping electrodes, but as no springs are used the electrodes will last for months.

The inlet and exhaust valves are both opened and closed mechanically and are thus positive and sure.

The vaporizing is of new design, the naphtha or gasolene being supplied to it mechanically and regularly, the air and naphtha mixed and the gas generated in the vaporizer. No naphtha goes into the motor and no naphtha is allowed to escape outside of the vaporizer, thus making the motor perfectly safe and reliable.

Less than one pint of naphtha or gasolene per actual horse-power per hour is required, and it is claimed that a two-hp motor will run a 21-foot boat carrying six or eight people over 30 miles with one gallon of naphtha.

The screw or propeller shaft furnished with the motor is of a new reversible pattern, having a ball thrust-bearing. It has no gear or large ugly-looking hub, but is neat and compact, and does its work perfectly without noise.

A slight movement of the lever will reverse from full forward to full back without any possibility of failure or paying any attention to speed. In this respect this motor and the reversing screw are said to excel the steam engine or any other power, excepting only the electric motor.

The upper part of the cylinder can be used to compress air into a tank to supply a whistle.

The Prall Rotary Motor.

W. Edgar Prall, Jr., whose rotary motor was mentioned in the last issue as being on exhibition at the Hotel Arno, Washington, D. C., writes that he is now engaged upon a carriage to be propelled by his motor.

Mr. Prall makes extraordinary claims for this motor, which he says runs without explosion or jar, and shows an efficiency greater than any other gas engine yet invented. The one to be used on the carriage, though only 6 inches in length and 6

inches in diameter, is claimed to develop four horse-power from a total weight of 50 pounds.

It is said to be self-starting, no attachments being employed for this purpose. As the combustion is continuous there are no firing valves or electric apparatus for igniting.

No differential gear is employed to drive the wheel independently on curves. The motor is so constructed that it automatically drives both wheels independently.

The whole outfit necessary to propel a light vehicle is so compact that when fastened directly under the spring board, it is hardly visible.

Kent's Lubricating Compound.

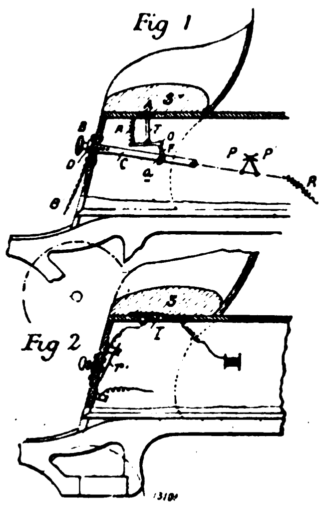
Lubrication is of the utmost importance in the gas motor. Many oils, satisfactory in ordinary cases, fail here, however, because of the severe conditions under which they are used. A new lubricant, known as Kent's Lubricating Compound, is now being extensively introduced all over the United States. From its peculiar qualities it should commend itself to the motor vehicle inventors.

It is largely composed of light mineral oil (petroleum), chemically united with tallow to give the required viscosity. Although it is soft 350 degrees of heat are required to melt it.

The Eastern agents are the N. Y. & N. J. Lubricant Co., 30 Cortlandt Street, New York.

A Device That Stops a Motor Automatically.

E. Roger, of Paris, has patented a device for automatically stopping a motor when the operator either accidentally or from design leaves his seat. It consists of a spring seat for the conductor, connected to a valve or switch controlling the supply of motive fluid to the motor or the circuit of the igniting device of the gas motor in such manner that when the weight of the conductor is on the seat the valve is opened or the circuit closed, and when the conductor is off his seat the seat rises to close the valve or open the circuit, and that the conductor can independently control the motor. Fig. 1 shows a mechanism by which the admission valve *P*, which admits the working fluid into the engine, is closed on taking the position *P*1 when the driver is no longer seated on the seat *S*, and in consequence the latter no longer rests on the head *A* of the rod *T*, jointed to the end of the lever formed by the two right-angled arms *L*, *F*, oscillating about the shaft *O*, on which is also fixed a lever *l*, at the extremity of which is a helical



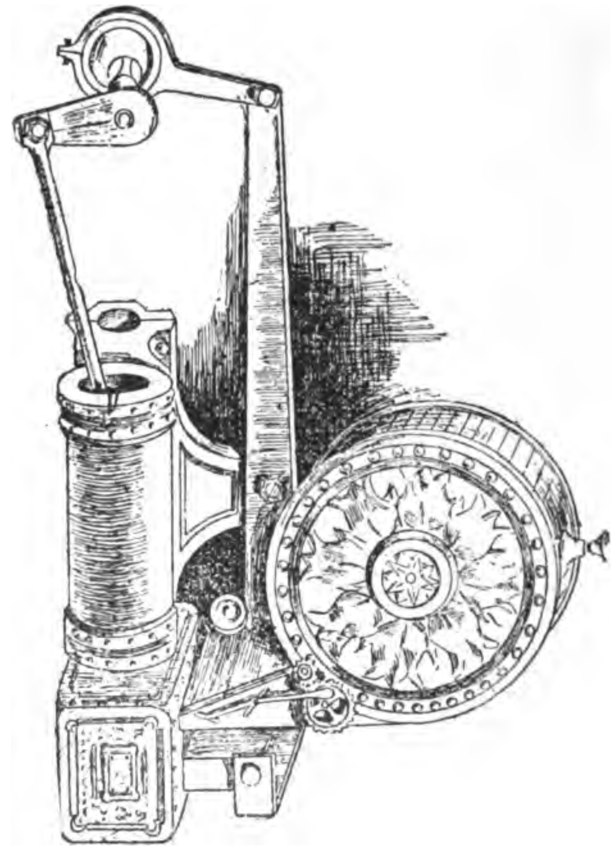
spring *R* acting in the contrary direction to the weaker spring *R*1. The bent arm *F* bears against a stud *a* fitted on the rod *C*, terminating in a manipulating knob *B* and sliding through a socket *D*, in which a hole is bored allowing a stop pin *B*1 attached to a chain to pass through. The rod *C* is provided underneath with notches which can engage or hook into other notches cut in the opening through which this rod passes. If the driver falls from his seat, then the first spring *R* reacts on the lever *l* and turns the shaft *O*, the arm *F* of which forces the pin *a* forward and moves the rod *G* in the direction of the arrow, when the valve *P* will assume the position *P*1, cutting off the passage of the working fluid. The notches at the bottom of the opening through which the rod *C* passes and those effected at the bottom of this rod, are arranged in such manner as to allow the movement of the rod *C* following the direction of the arrow under the preponderant action of the spring *R* relieved of the weight of the driver. In internal combustion engines where the gaseous mixture is exploded by an electric spark, the modified arrangement shown by Fig. 2 is employed, in which the seat weighed down by the driver maintains the continuity of the circuit through the spring *r*, acting as a contact. The circuit is broken when the driver moves from the seat *S*, as the spring *r* rises and does not maintain the contact necessary for the passage of the electric current.

Mr. Roger has also patented this invention in England, the number being 13,101.

A Gunpowder Motor.

A gunpowder bicycle is the invention of a Pennsylvania merchant. It is, he declares, to be run by a motor which, with a weight of 8¾ pounds and a length of 8 inches, will, when charged with ordinary gunpowder, carry a machine and rider 100 miles.

The small cylinder of the motor is 3 inches long and 1 inch in diameter. At the forward end is the exploding chamber. This is 2 inches long, 1½ inches high and 1¾ inches wide. From the rear end projects the driving rod. Above the cylinder is the powder magazine, 4 inches in diameter and 2 inches deep. It is from this magazine that the explosive is supplied, by means of a feeder, to the exploding chamber below. The motor is fastened to an ordinary bicycle in place of the pedals and sprocket chain.



The exploding chamber is the heaviest part of the motor. It is constructed of steel, and in it the powder explodes as it comes from the magazine through the feeder. As the explosion occurs a gaseous smoke is generated which acts much the same as steam, in that it operates the piston head of the driving rod within the cylinder, one end of which is connected with the exploding chamber. As the volume of this gaseous smoke is increased the action of the rod is proportionally increased and an increase of speed results. To avoid any possi-

bility of the explosion of the gases generated by the powder there is a valve at the top of the exploding chamber, through which the excess of gas is automatically allowed to escape.

The speed of the machine to a certain extent regulates the action of the valves in the supply chute. There is a small thumbscrew in the chute which adjusts the angle of the back of the chute, forcing it nearer the valves or increasing the speed as the rider may wish. A rod working from the rear wheel to the chute opens and closes the valves as the wheel revolves, and thus allows the powder to escape from the magazine.

When starting, the powder is exploded first by concussion. The rod is forced down, the valves in the chutes are opened and a cap within the chamber is exploded, causing the machine to start. Just the reverse operation brings the machinery to a stop. The drawing upward of the rod closes the valve, causing the flow of powder to cease, and as no more gaseous smoke can be generated the machine comes to a gradual stop. To make a sudden stop the ordinary brake is used.

The motor is fastened to the frame of the bicycle by a clamp, and when made fast nothing except the breaking of the machine frame can displace the motor from its position.

So little powder is exploded at a time that there is no smoke and no odor, and the inventor claims that the action of the motor is so even that riding is much like coasting down a good hill on an ordinary machine.—*N. Y. Herald.*

M. Marcel Desprez on Road Motive Powers.

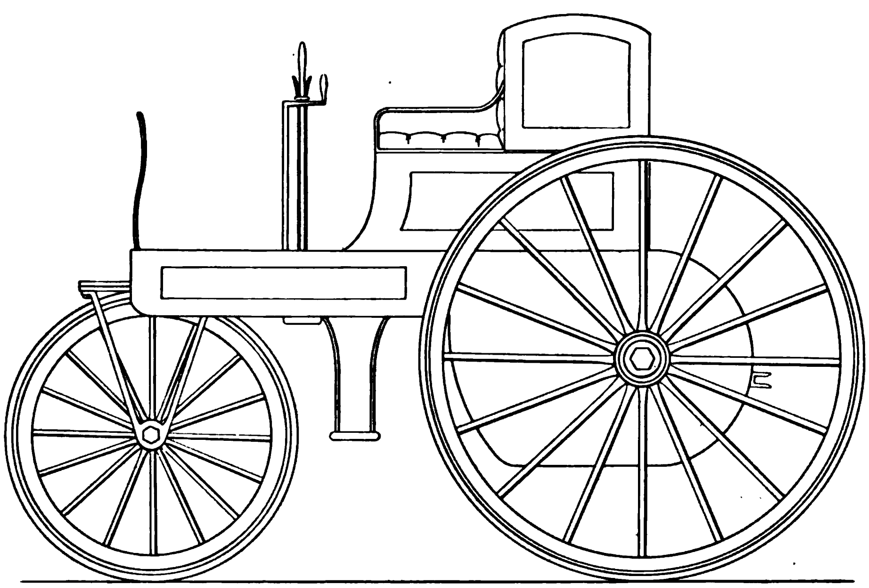
In the course of a lecture recently delivered before the Automobile Club, M. Marcel Desprez, member of the Institute of France, reviewed the history of the motor vehicle from the beginning, and introduced some very interesting data in regard to the various motor powers employed. He said that petroleum undoubtedly had the lead at present, but that steam in point of cheapness was superior to it, though handicapped by the weight of the boiler. Where economy is of little account he sees an opening for electricity, but until better batteries are invented the electric carriage will be used exclusively by the rich, and will not be able to travel great distances.

Steam he regarded as the power that will be utilized for the public conveyance of passengers at low prices. Up to the present the failure of steam in road locomotion has been due entirely to fortuitous circumstances. Compressed air and hot water he regards as out of the race entirely. In the course of his remarks on the petroleum carriage M. Desprez raised a new question. If we are to depend on petroleum motors entirely in road locomotion, he said, we shall sooner or later be brought face to face with an oil famine. The total quantity of coal extracted throughout the world is 400,000,000 tons a year, but the total quantity of petroleum only 8,000,000 tons. If petroleum motors are used exclusively on road carriages, therefore, with their rapid extension it will not be possible in course of time to get sufficient supplies of the oil, as its consumption is increasing enormously in other lines. Hence another reason why steam is preferable as a motive power.

Acetylene Motors.

A firm of Italian engineers has recently constructed some small cars which are propelled by motors driven by acetylene gas. The charge consists of acetylene gas dissolved in fifteen times its volume of air, and with this mixture it has been found unnecessary to use water for cooling the cylinders. The method of igniting the charge has not, however, been made known. According to the *Gastechniker*, the motors maintain a speed of 600 revolutions throughout a working period of fifteen hours. The weight is only about 20 pounds, and 0.8 brake horse-power is developed. The cost of working it is said to be about 12 cents per hour.

An acetylene gas motor, weighing nine kilogrammes (20 pounds), giving out a brake power of 62 kilogrammes (448 foot pounds), and capable of working fifteen hours without being touched, has, it is stated by the *Rivista Technico Italiana*, been designed by Sig. Pedrell, of Parma, who has fitted it to a bicycle.—*Scientific American.*



DESIGN OF PROUTY ROAD MOTOR.

CORRESPONDENCE.

"The Noise Question."

Editor Horseless Age.

DEAR SIR:—Under the above heading an article appeared in your December issue which was not only very ably and intelligently written and quite timely, but same also disclosed the fact that its writer is very intimately acquainted with the essential and vital requisites necessary for a practical and commercial success of the horseless vehicle, which means a success so complete as to even remove what pedestrians and other occupants of the street might feel inclined to complain of, namely, the absence of a distinctive and characteristic motor vehicle approach and danger signal.

As you request opinions from your readers on this head, I take the liberty of directing attention to the approach and danger signal invented by Mr. Jos. J. Kulage, of St. Louis, Mo., and which signal he has embodied in his very unique and recently patented horseless vehicle.

As special features of this invention, I may briefly mention that same admits of the imitation of practically any sound—and in all degrees, from faint to loud and powerful; and said sound to be of short duration, or intermittent, or continuously, as long as the vehicle or its motor is in operation; and that all of this is accomplished in an automatic manner by either the exhaust from the motor, or by bellows actuated from parts of the vehicle.

Mr. Kulage, the inventor, according to his expressions, prefers as a distinct and characteristic approach and danger signal for motor vehicles a rattling or trilling or tremulous sound, such as, for instance, a policeman's whistle, which sound is easily produced by placing a little ball or rounded object loosely into the whistle, so that the exhaust or wind oscillates or vacillates same while producing the sound.

AMICUS.

The Use of the Exhaust as an Alarm.

Editor Horseless Age.

DEAR SIR:—Your recent editorial on the matter of a signal for horseless vehicles was read with much pleasure, and in reply the writer offers the suggestion that the exhaust gases of the petroleum-driven vehicles can and should be used to actuate an alarm.

In most vehicles of this class the exhaust is very abrupt, and unless muffled makes a very objectionable sound.

It would probably suffice as a warning to permit these gases suddenly to escape into the open air without passing through a muffler.

Some have met this suggestion with the argument that it would frighten horses, but there is no reason to suppose that this would be any more true of a series of exhaust puffs than of the squawk of a horn or the blast of a whistle.

The alarm could be turned off at will, and the added mechanism would be very slight.

It has been common practice for a number of years to use either the horn or the whistle on vehicles and launches not steam driven, and there is no reason why the exhaust gases should not be used to blow the said whistle or horn instead of operating it by hand, or other power, as has heretofore been done.

The writer thinks therefore that a very satisfactory solution of your question is found in either using the exhaust noise as a warning, which would be prominently distinctive, or else using the said gases to operate a whistle, which, by its intermittent action, would soon become almost equally distinctive.

CHAS. E. DURYEA.

Favors the Vibrating Bell.

PAWTUCKET, Jan. 19, 1897.

Editor Horseless Age.

DEAR SIR:—I have read your interesting editorial on noises and the proper alarm for use on motor vehicles. For my part, I am strongly in favor of the vibrating bell. Its sound is readily located and has not the paralyzing effect of a gong: it also has not the long-distance penetrating effect of the horn or whistle. There are noises, and then again there are noises. Deliver me from living in a city with the driver of every vehicle tooting a horn.

There is no need of mistaking a carriage bell for a bicycle bell, as no bicyclist will encumber his wheel with a five inch bell, which is about the proper size for a carriage.

Yours respectfully, HARRY E. DEY.

The American Motor League.

CHICAGO, Jan. 15, 1897.

DEAR SIR: The time has arrived when, according to the constitution of the American Motor League, it is necessary to have an election of officers for the coming year, and the purpose of this notice is to request you to record your vote by mail for such action.

The American Motor League has been very quietly and conservatively at work the past year, aiding in the development of the motor vehicle. It was not believed at the organization of the league a year ago that it would grow rapidly or that its good effect would show at once. It is keeping a steady hand on affairs, however; its membership is growing steadily—if slowly, and now that we can see a brighter outlook in the near future for the motor vehicle, the league will undoubtedly have work to do, and it will take a position of responsibility and authority.

It is suggested by those who have had most to do with organization and administration, that it will be wisdom on the part of the members to continue the present officers for the coming year. If you are in sympathy with this suggestion, kindly signify your wishes at as early a moment as you can. The directors will be glad of any advice or suggestion that you have to offer. If you desire that the officers for the year be changed, and will indicate your preference in detail, it will be recorded.

The membership fee of $1 for renewal of membership is due and the directors will be pleased to have you remit at your convenience. Trusting to hear from you at once, I am,

Yours very respectfully,
J. ALLAN HORNSBY,
Secretary.

Two of the electric hansoms which the Electric Carriage and Wagon Company are to introduce in New York City for public service are now stabled at 140 West Thirty-ninth Street. These vehicles were illustrated in the September issue of THE HORSELESS AGE.

FOREIGN NOTES.

The Automobile Club will hold a general meeting on Feb. 16.

Motor fire engines are to be tried at Paris. The power will be petroleum.

Panhard & Levassor are said to be working on a new motor without a water jacket.

Motor carriages are now allowed in the Bois de Boulogne, a privilege which has heretofore been denied by the authorities.

Panhard & Levassor are executing a number of orders for railway inspection cars. One of these orders came from South America.

De Dion & Bouton are said to be constructing a tandem quadricycle, which will weigh about 290 pounds, and be capable of a speed of 15 miles an hour.

It is reported that a motion has been introduced in the Council of the City of Amsterdam, Holland, forbidding the use of motor vehicles in the streets of the city.

M. Jeantaud, the well known carriage builder, of Paris, is doing such a thriving business in the motor carriage line that other fasionable Parisian carriage builders are following suit.

M. Amédeé Bolleé used rubber belting in the motor carriage he constructed for the Paris-Marseilles race. No pump is employed to circulate the water for cooling the cylinders, the difference in density being said to accomplish this purpose very well

A commission is now engaged in drawing up a set of regulations to govern motor vehicle traffic in France. Among its members are such well-known men as Levassor, de Dion, Bolleé, Jeantaud and Scotte. A liberal code may, therefore, be looked for.

Ludwig Lohner, of Jacob Lohner & Co., Vienna, Austria, who is introducing motor vehicles in that city, has issued a comparative table showing the economy of the motor over the horse in cost of operation. The first cost he estimates as about the same.

Paris *Velo* has offered prizes amounting to 2,000 francs for a motorcycle race, to take place next April. The distance will be about 60 miles over a level road, and competing machines must not weigh over 425 pounds. It is to be a sporting event rather than a scientific test.

The Australian Horseless Carriage Syndicate, Melbourne, Victoria, are now bringing out several different styles of motor vehicles, propelled by a gasolene motor of local invention, which they control. The syndicate believe they can employ kerosene successfully in this motor.

The electric omnibus of Radcliffe Ward was recently given a very satisfactory test in London. It carried 25 passengers from the Hotel Victoria, through Trafalgar Square, to the Marble Arch, in 13 minutes, beating cabs and hansoms *en route*. It is the intention of the London Electric Omnibus Company to put 100 of these buses into service as soon as possible.

Leon Lefebvre, Paris, France, manufacturer of the Pygmeé motor, has received an order from a local cab company to fit a motor to one of the company's cabs. The motor will be placed on a separate carriage or bogie frame, which will take the place of the fore wheels of the cab. The rear wheels of the fore-carriage will be used as the drivers and the front wheels for steering. Transmission will be made by leather belting.

The Belgian Automobile Club are busy with arrangements for the accommodation of exhibitors in the motor section of the International Exhibition, which is to be held at Brussels this year. Many important concessions have been obtained from the authorities of the exhibition as well as of the city, so that exhibitors are promised an opportunity to display their vehicles to advantage and thus make important commercial connections.

M. Tenting, 47 Rue Curial, Paris, exhibited at the last Salon du Cycle several carriages employing the friction cone transmission. His motor has two-inclined cylinders working on a common crank. The crank axle carries a friction cone operating two smaller ones near its periphery. The pressure of these small cones on the larger wheel is maintained by springs, and they may be withdrawn from contact by a lever when it is necessary to throw the mechanism out of gear. Between the small cones, and parallel to the large friction wheel, is a wheel running loose on the crank axle, and carrying the pinion which is geared on to the driving wheel. This loose wheel may be drawn backward and forward between the centre and periphery of the small cones to vary the speed, or it may be thrown out of contact altogether. The machinery is connected with the driving wheel by a cog-wheel gearing.

MINOR MENTION.

It is reported that a company is to be organized in Chicago to build express and delivery wagons under the Prouty system.

The Kammann Electric Co., Minneapolis, Minn., has been organized to build electric vehicles and launches and other electric apparatus under the patents of W. T. Kammann.

Wood & Meagher, Richmond, Va., state that they have received a very large correspondence through THE HORSELESS AGE, and will soon be ready to furnish particulars to all inquirers.

P. F. Olds & Son, Lansing, Mich., state that owing to pressure of business in their gas engine department, they have been unable to build any motor carriages for the market. They intend to do so soon, however.

Philip T. Courtney, engineer and draughtsman at the Vulcan Foundry, New Castle, Pa., has invented a motor carriage complete, which he is now testing, and particulars of which he promises for our next issue.

Geo. W. Lewis, inventor of the Lewis gas engine, has organized a company to manufacture his engine for boats, vehicles and general stationary work. The factory of the new concern, which will also make the Lewis motor carriage, is at 153 West Jackson Boulevard, Chicago, Ill.

The Mills Gas Engine Company, manufacturers of boat and vehicle motors, are moving their shop from Arbutus, Md., to Elk Ridge, about three miles distant, on the Patapsco River, where they will have better facilities for launch work. Their vehicle motor will have two cylinders and no stuffing boxes.

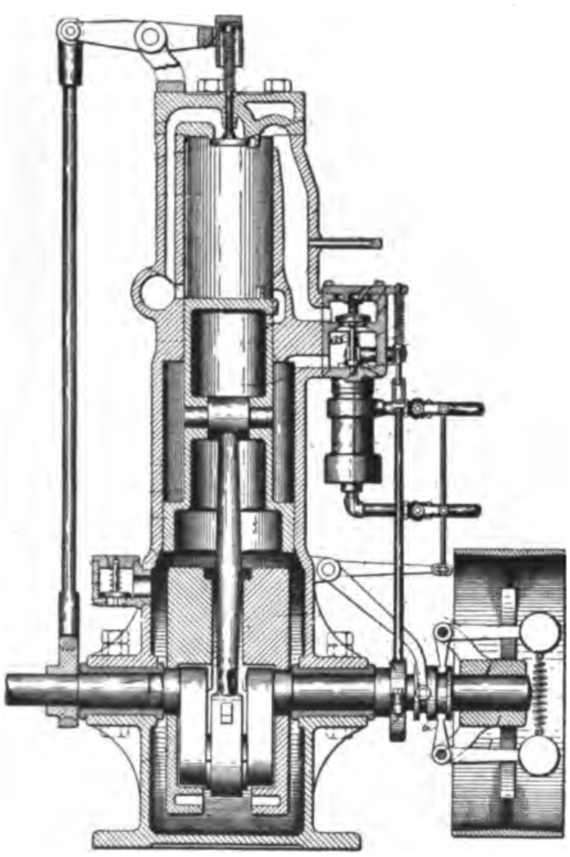
Recent Motor and Gas Engine Patents.

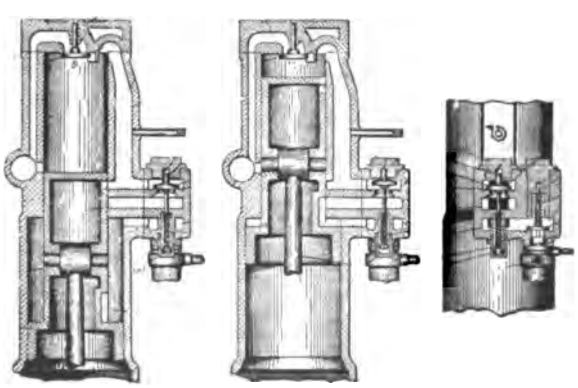
574,535. *Gas Engine*.—Carl L. Grohman, Hartford, Conn. Filed March 31, 1896. Serial No. 585,647.

The inventor's object is to devise a simple engine giving an impulse every revolution.

The piston is compound, comprising a working piston and a compression piston, and is chambered, though constructed as one member. This piston, which is of differential diameters to correspond with the differential diameters of the cylinder, separates the chambered casing into a working compartment and a compression department.

The exhaust valve is actuated by a spring connected by a pivotal lever to an eccentric on the crank shaft. This pivotal lever is bifurcated at its inner end and is pivotally connected to an inverted cup-shaped sleeve, enclosing the upper end of the valve stem, so that on the downward movement of the sleeve the valve stem will be depressed to actuate or depress the valve member.





The valve seat constitutes the end of a port or passage opening into the working chamber when the valve is open, and communicating with a main passage which conveys away the products of combustion.

From the lower end of the working chamber leads a second port opening into the main port and assisting the outflow of the products of combustion from the chamber. This working chamber also has an inlet port slightly below the eduction port and in position to communicate with the chamber of the compound piston, by means of a port of the working piston, when this compound piston has reached the completion of its downward stroke.

The valves are of the poppet type, operated by springs, the induction valve being actuated by the suction of the piston.

The vaporizer has within it a gas conductor provided with a spiral channel, leading from its upper to its lower end, so that the area of the gasolene is increased and its evaporation facilitated. The gasolene is led into the upper end of this vaporizer and flows down around the spiral chamber. The portion not evaporated collects in a trough at the bottom and is taken back to the reservoir by an overflow pipe.

The gasolene is first mixed with hot air, then with cold air, the supply of both being regulated by valves.

In the operation of this engine, the liquid having been conveyed to the evaporator and there vaporized by the hot air and then united with the cold air, and the action of the compound piston on its downward movement having caused sufficient suction to raise the valve—which is also somewhat assisted in its opening movement by the gaseous fluid beneath the valve in the evaporator—the gaseous fluid is drawn from the evaporator through the chamber of the valve-chest to the compression chamber of the cylinder until the piston has reached the end of its downward stroke. At the same time the piston compresses the air in the crank-chamber, and thus causes the air to rush into the chamber of the compound piston and through the port of the working piston, and into the working chamber by means of a port, opening into said chamber and communicating with the working piston-port when said piston has reached the limit of its downward stroke, and thus replace to a great extent the burned gases, the piston having previously uncovered the exhaust port, leading to the main exhaust port and permitted a portion of the products of combustion, resultant from the previous explosion in the working chamber, to pass out through said port, thereby assisting to clear the chamber and also to reduce the pressure on the exhaust valve, in order to permit the same to be readily opened at the proper time.

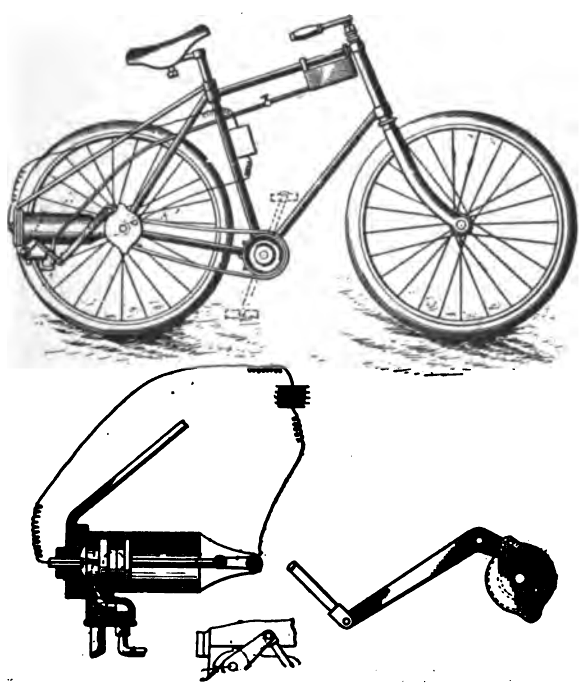
The working piston is provided with a deflector, adapted to direct the fresh air upward. On the return or upward stroke of the piston the exhaust-valve is opened by means of the connecting mechanism, comprising the eccentric, rod, and lever, whereby the fresh air, admitted into the working chamber through ports from the crank-chamber, forces out the remaining burned gases during the greater portion of the upward movement of the piston, to thereby permit the clearing of the chamber preparatory to the next explosion. This upward stroke of the piston creates a vacuum and a suction in the crank-chamber sufficient to open the fresh air inlet valve and

fill the crank-chamber with fresh air preparatory to compressing the same and forcing it into the working chamber.

At the same time the piston during the major portion of its upward stroke greatly compresses the gaseous fluid previously conveyed from the evaporator through the valve-chest chamber to the compression-chamber of the cylinder—and which substantially filled both the cylinder compression-chamber and the valve-chest chamber when the piston was at the end of its downward stroke—back into the valve-chest chamber alone, thereby bringing it under great compression, the valve having been closed by its spring when the piston practically reached the end of its down stroke, and when the piston reaches a predetermined point in its upward movement and adjacent to the top of the cylinder and also practically simultaneously with the closing of the exhaust-valve the eccentric on the crank-shaft is rotated into position and actuates the rod which operates the valve-actuator to release the valve so that the pressure of the gaseous fluid opens the valve against the pressure of its low power spring, and thereby permits the fluid to flow into the passages, where it is ignited and exploded in the working chamber to force the piston downward and again draw in a fresh supply of gaseous fluid, whereby the operations just stated are continued.

574,818. *Wheeled Vehicle.*—Edward J. Pennington, Chicago Heights, Ill., assignor to the Motor Cycle Company, Chicago, Ill. Filed March 21, 1893. Serial No. 467,043. Patented in England Dec. 11, 1895, No. 23,771.

The inventor states that his object is to avoid the special compression cylinders and other devices hitherto employed, which have rendered explosive engines too heavy to be used on light vehicles, such as bicycles and tricycles. To accomplish this, he claims to compress the explosive mixture through the momentum of the load (or rider) on the vehicle. Apart from this load the vehicle will not run, "for the compression of the explosive mixture acts as a brake, but when the rider mounts and starts the vehicle, the additional weight stores the power and furnishes the momentum for overcoming the resistance opposed by the compression."



The usual pedals are retained on the bicycle to assist in hill climbing and starting.

The piston of the motor is coupled direct to a crank fast to one (or a pair) of the wheels of the vehicle.

An elastic tire is said to be necessary under the rider's weight in order to give the wheels sufficient adhesion.

The cylinder of the motor has a rear head only, the front being unclosed and provided with an extension having an eye which fits loosely over the axle of the wheel so as to act as a support. The rear end of the cylinder is secured to the rear standard of the frame by means of a brace.

The gasolene is admitted to the branch to which the exhaust pipe is attached through a pipe, the admission being controlled by means of a valve and provision being made (as by one or more openings into the pipe between the valve and the branch) for the admission of air to form the explosive charge. The admission of the explosive mixture to the rear end of the cylinder and the exhaust resulting from the explosion of the gases are controlled through a tapering valve-barrel, made with ports in the usual manner. The valve-barrel is provided with an arm, attached to the long arm of a valve-lever or bell crank by means of a link, the short arm of said valve-lever or bell-crank being provided with a device, which enters the groove of a valve-operating cam, mounted upon the axle of the rear wheel. In the revolution of this axle the necessary movements of the tapered valve-barrel are given to control the admission and exhaust of the explosive and exploded mixture.

The connecting-rod is attached to the piston by means of a ball-and-socket joint, which admits of the oscillation of the connecting-rod necessary in view of its connection to the crank, mounted fast upon the axle of the rear wheel.

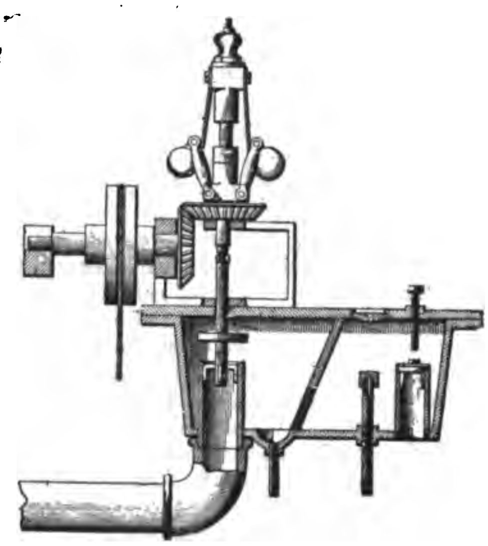
The electric battery, to ignite the mixture, is mounted upon the frame of the vehicle, and a wire passes from one pole thereof through the rear head of the cylinder, the inner end of the wire being furnished with a contact-piece for engaging a similar contact-piece on the outer end of the piston at the termination of its back stroke. The circuit is completed by means of a third contact-piece, bearing against the axle of the rear wheel, and a wire reaching from this last contact-piece to the opposite pole of the battery, the current passing through the metal of the cylinder, connecting-rod, etc. The arrangement is such that the charge of air and gasolene or other fluid is exploded by the separation of the contact-piece of the piston from the contact-piece at the rear head of the cylinder.

At the end of an instroke preparatory to an explosion, the valve closes the port by which both inlet and exhaust communicate with the interior of the cylinder. The explosive charge is supposed to have been compressed in the end of the cylinder during the previous instroke of the piston. As the piston moves outward the contacts are separated, the spark passes, an explosion takes place, and the piston is forced out, turning the wheel and propelling the vehicle. As the piston finishes its outstroke and returns the cam acts through lever and link to shift the valve and opens the communication between the port and the exhaust. The valve being held open by the cam the piston on its instroke forces out the products of the explosion. After the piston has finished its instroke the cam shifts the valve and puts the port in communication with the inlet.

The forward motion of the piston sucks in the air and gasolene vapors, and at the end of the outstroke the cam shifts the valve back into the closed position. The instroke of the piston (under the momentum of the rider or load of the vehicle) then compresses the explosive mixture while the valve is closed, and the ignition and explosion of the compressed

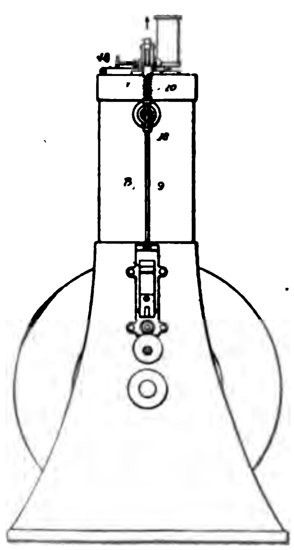
charge and subsequent operations then take place in order, as already mentioned. This cycle of inspiration, compression, explosion, expansion, and exhaustion in two revolutions of the crank-shaft is common in explosive engines of the compression type.

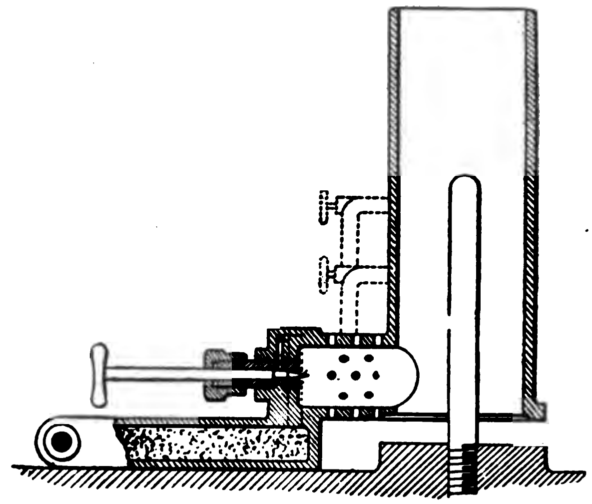
574,614. *Gas Engine Attachment.*—George W. Lamos, Fort Madison, Ia, Filed April 30, 1896. Serial No. 589,705.

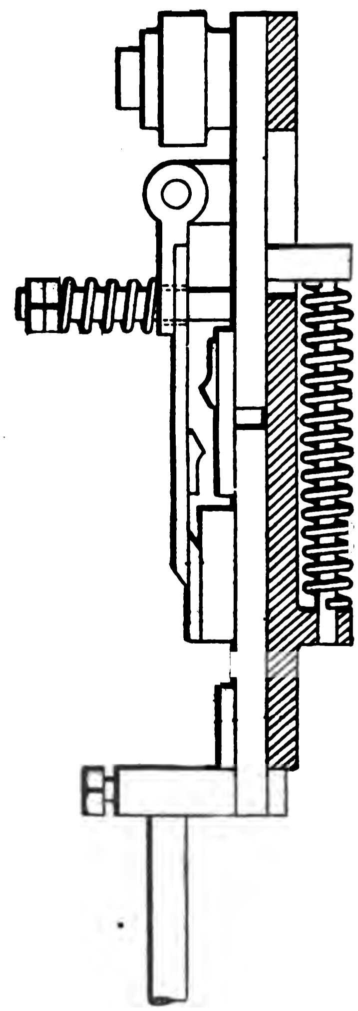


This invention is a governor to regulate the speed of a gas engine and stop it automatically in case the governor belt breaks.

574,670.—*Gas Engine.*—Walker L. Crouch, New Brighton, Pa., assignor to the Pierce-Crouch Engine Company, same place. Filed Nov. 30, 1895. Serial No. 570,665.







In the operation of this engine the vaporized oil and air are mixed within the chamber and pass through the opening into the casing when the flame is definitely directed against the

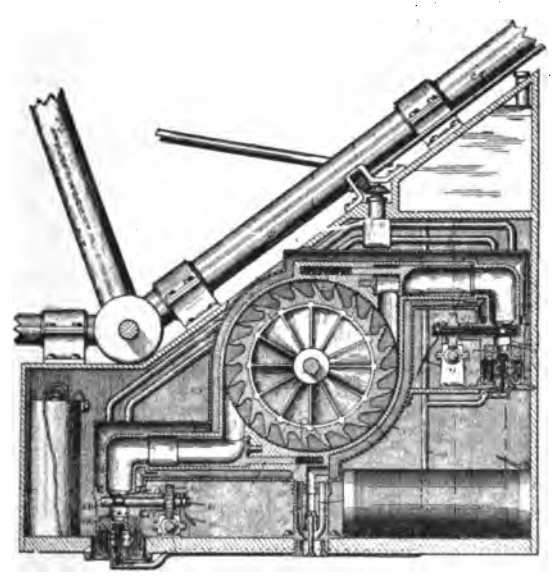
ignition-tube, which it heats sufficiently to ignite the charge in the working cylinder. After each explosion the igniting-tube will be filled with spent gases, so there is no danger of the discharge of a fresh charge when first admitted when the piston is in its forward position; but as the piston moves backward it compresses the previously-admitted charge and the spent gases in the ignition-tube, so that the fresh gases are forced into the tube to the ignition-point. All liability of premature explosion may be obviated by moving the furnace longitudinally of the igniting-tube to direct the flame against the tube at the desired point. This is effected by adjusting nuts upon the screw-thread rod, it being apparent that the farther the ignition-point is removed from the cylinder the greater the time between the compression and explosion of the charge in the cylinder, and *vice versa.*

The vaporizer is in the form of a tube, which is preferably filled with a suitable heat-absorbing material, such as gravel, metal turnings, etc. This vaporizer is arranged in such close proximity to the heater or blast furnace as to be heated sufficiently to vaporize the oil before it reaches the burner, thus dispensing with the use of a separate heater for the vaporizer.

To effect the adjustment of the furnace longitudinally of the igniting tube, a vertical series of vapor nozzles and mixing-chambers are so arranged that a flame may be directed through any one of the nozzles. Again, the casing may be fixed stationary upon the cylinder and be provided with a longitudinal slot in which the heater, which in all the constructions may be either a blast furnace or an ordinary gas or oil flame, may be adjusted to bring it opposite any point of the igniting-tube.

575,639. *Vehicle Motor.*—George W. Foye, Philadelphia, Pa. Filed April 28, 1896. Serial No. 589,421.

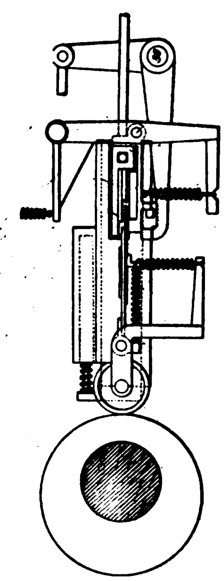
This invention is intended chiefly for bicycles to be used as an auxiliary power or not, as preferred. The operation is described as follows: The lamps are first lighted and permitted to burn a sufficient length of time to heat the diaphragms when the power-shaft is given an initial movement, thereby putting in motion the valves, which admit small quantities of oil through the openings to the retorts, where the oil is converted into gas, which is ignited and produces a pressure within the tubes and extensions. This pressure forces the plunger-valves inward against the action of the springs, causing the passages through said valves to register with the compartment in which the motor-wheel is journaled, thereby admitting the expanded gas to this compartment, when the gas acts upon the blades, causing the motor-wheel to revolve after the manner of a turbine.



Two cylinders are provided, one a working cylinder and the other an air-feeding cylinder, the function of the latter being to force air into the working cylinder. A mixing or explosion chamber is provided, which communicates with the end of the working cylinder through a passage of constricted area, the gas or oil vapor being admitted to the mixing or explosion chamber and subsequently mixed with the air just before explosion takes place. The air cylinder communicates with the working cylinder through a duct which opens into the working cylinder at its end. The exhaust-port is situated near the middle of the cylinder and the dead or exploded gases are expelled from the cylinder by the joint action of the returning piston and the fresh air admitted at the opposite end of the cylinder. When the returning piston reaches a predetermined point of its travel, the exhaust-valve is closed and compression begins, the fresh air being forced through the constricted passage into the mixing-chamber, where it commingles with the vapor or gas which has been admitted to the mixing-chamber. The fresh air is forced into the mixing-chamber by the joint action of the returning piston of the working cylinder and the advance of the piston of the air-cylinder forcing air through the duct into the working cylinder. The mixture may be exploded in any of the usual ways. The exploding gases pass from the explosion-chamber into the working cylinder and impel the piston forward. The oil or gas is forced into the mixing-chamber by means of a pump, the stroke of which is regulated to govern the engine.

575,502. *Gas Engine.*—Walker L. Crouch, New Brighton, Pa., assignor to the Pierce-Crouch Engine Co., same place. Filed Nov. 22, 1895. Serial No. 569,829.

This is one of a series of patents which the inventor is now bringing out. It is a valve device for gas engines. Some of the gas engines now upon the market have a great many



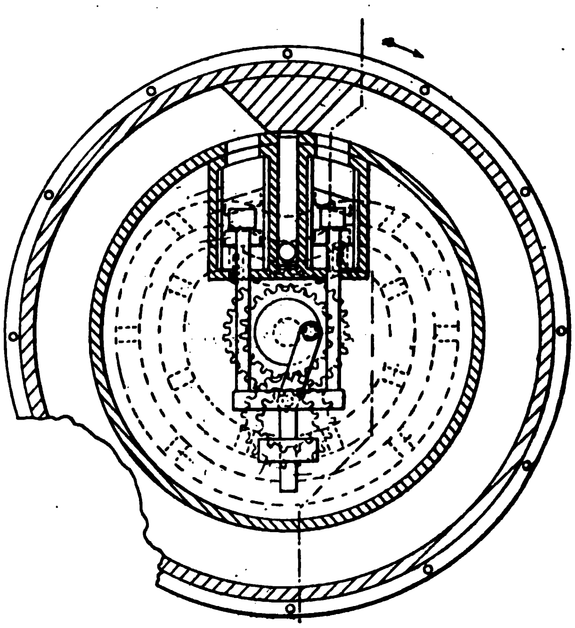
rather delicate valves operated by the action of the piston in discharging the burnt gases, or by the suction of the piston in drawing in fresh charges ; that is to say, the gases lift the valves in one direction, and a rather delicate spring closes them. These valves are more or less unreliable, according to their construction. Very little friction is sufficient to prevent them from performing properly, thereby causing the engine to either lose power or to stop entirely. Springs are liable to break or become set, and the numerous valves of this type tend to make the engines unreliable

With this end in view the inventor has been seeking for some device which is simple and at the same time positive in its action ; and this he believes he has. There is but one poppet valve entering the cylinder of the gas engine, and that is operated by positive means. There is another piston valve driven by strong positive means also, which serves first to direct the discharge of exhaust gases during the discharging stroke of the piston and crosses a single port, closing communication with the exhaust outlet and opening the air and gas inlets during the suction stroke of the piston. The poppet valve closes, preventing the high heat of the explosions from injuring the piston valve.

This device has been tried on the Brighton stationary engines for almost two years, and is said to be entirely satisfactory.

575,517. *Rotary Gas Engine.*—John D. Blagden, Wood's Hall, Mass. Filed Aug. 12, 1896. Serial No. 602,502.

This rotary engine is provided with a cylindrical stationary casing carrying at its ends central offsets or projections secured in standards. The stationary casing is surrounded by a cylinder formed with a rim, and with heads formed with hollow trunnions respectively mounted to turn on the above-mentioned projections. The heads fit snugly against the ends of the casing, and the rim is placed a suitable distance from the rim of the casing, so as to form an annular working chamber between the said rims. Into this working chamber extends an abutment attached to the rim and abutting against the exterior surface of the rim of the casing.



Into the working chamber passes a piston, fitted to slide radially in suitable bearings in the casing, the said piston being provided on its sides with trunnions or friction rollers engaging cam-grooves formed on the inner faces of the heads. The lower portions of the cam-grooves are concentric to the cylinder casing and the cylinder, and the upper portion is grooved, so as to withdraw the piston back into its bearings at the time the abutment passes over the bearing containing the piston.

On opposite sides of the bearing for the piston are arranged valve-chests in communication at their upper ends by ports and with the working chamber to permit the air and gas to pass through the port into the chamber and allow the products of combustion to pass from the chamber through the other port into the chest, from which they can pass to the outside. A gas-supply pipe connects with the interior of the valve-chest, said pipe leading to the central opening in the projection, the opening being connected with a suitable source of gas-supply.

In the chests are formed ports two of which connect with the cam-groove, and the other two, opening into the interior of the casing, contain the check-valves. These ports are controlled by slide valves, secured on valve-stems, extending through the bottoms of the chests to connect at their lower ends and within the casing with a cross-bar having a guide-arm fitted to slide in a bearing attached to the inside of the casing.

The cross-bar connects by a pitman with a crank-disc, secured on the inner end of a shaft, mounted to turn in the projection of the fixed casing. The outer end of this shaft carries a gear-wheel in mesh with a pinion, secured on a shaft mounted to turn in suitable bearings in the standard and carrying a gear-wheel in mesh with another gear-wheel secured or formed on the hollow trunnion. The gearing is proportioned in such a manner that when the cylinder makes two revolutions the crank-disc makes one revolution.

The annular groove, previously mentioned, is connected by openings with the outside so that the products of combustion can be discharged through the openings to the outside and at the same time atmospheric air can pass through the openings into the groove, to pass from the latter by the port into the valve-chest.

575,326. *Gas Engine.*—Harvey S. Bristol, Chicago, Ill. Filed Sept. 7, 1895. Serial No. 561,725.

This invention was fully described in the February number of THE HORSELESS AGE.

575,445. *Rubber Tire.*—Elias L. Toy and Albert T. Holt, Akron, O. Filed Sept. 26, 1896. Serial No. 607,021.

575,720. *Gas Engine.*—Joseph Ledent, Baltimore, Md. Filed July 1, 1896. Serial No. 597,669.

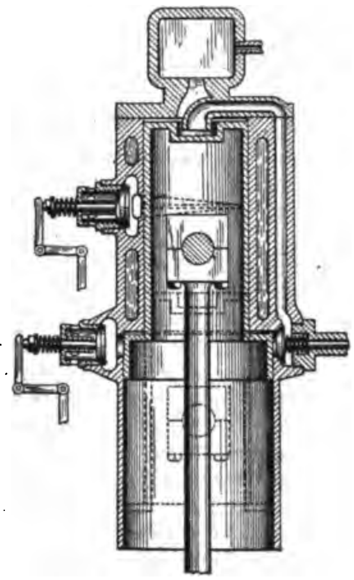
575,812. *Explosive Engine.*—Frederick C. Southwell, Grantham, England. Filed May 13, 1895. Serial No. 549,122.

575,878. *Gas Engine.*—Frederick W. Coen, Chicago, Ill. Filed May 14, 1896. Serial No. 591,465.

574,388. *Electric Propulsion of Vehicles.*—William A. Butler, New York, N. Y., assignor to John Gilmore Boyd, same place. Filed March 19, 1895. Serial No. 542,373.

574,762. *Oil, Gas or Like Engine.*—Walter Rowbotham, Birmingham, England. Filed April 30, 1896. Serial No. 589,774.

575,661.—*Gas or Oil Engine.*—Walter F. Trotter, Marshalltown, Ia. Filed May 18, 1896. Serial No. 591,919.



574,610. *Gas Engine.*—Gustaf Johanson, Berwyn, Ill. Filed Sept. 20, 1895. Serial No. 563,053.

574,712 and 574,713. *Wheel for Vehicles.*—James S. Copeland, Hartford, Conn., assignor to the Pope Manufacturing Company, same place, and Portland, Me. Serial Nos. 595,261 and 595,262.

574,723. *Gas or Oil Engines.*—Eugene Fessard, Poissy, France. Filed Feb. 26, 1896. Serial No. 580,799, also patented in France, in England, Belgium and Austria.

New Building of the American Motor Co.

Preparatory to the erection of a large brick factory on Hudson street, Hoboken, opposite their present quarters, the American Motor Co. are putting up a temporery addition to their present building. The new structure, which is to be of wood, will be 100 feet in length.

BOOK DEPARTMENT.

A Sparking Dynamo.

The accompanying cut represents a small dynamo for sparking gas engines and motors, which the electrical supply house of J. H. Bunnell & Co., 76 Cortlandt Street, New York, are now placing on the market,

Its weight is about 25 pounds, voltage 8, and its output 25 watts at 1,000 revolutions per minute.

Dr. Robert Coltman, Jr., Pekin China, writes that he has a commission from Prince Ting to purchase for him a motor carriage when the price reaches a figure satisfactory to His Majesty. The doctor states that other mandarins would be sure to follow the Prince's example.

The Moreau Bicyclette.

The French are experimenting in the line of the light motor bicycle, having refused to accept the heavy style introduced by Hildebrandt & Wolfmuller a year or two ago.

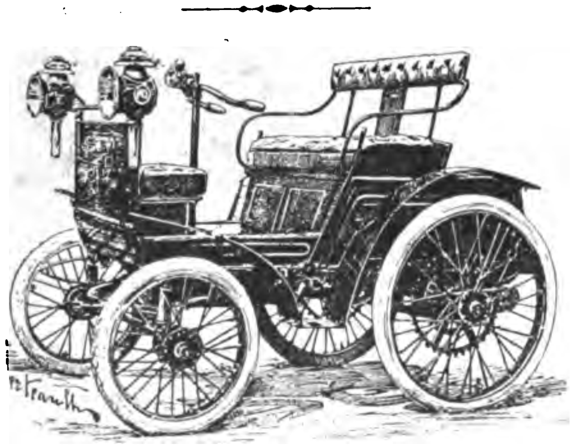
As a recent example of what our progressive contemporaries are doing in this direction we reproduce from *La Locomotion Automobile* a cut of the Moreau bicyclette, lately seen in the streets of Paris.

In general appearance it differs little from the ordinary bicycle. The principal change is in the rear wheel which is specially made for this purpose and replaces the ordinary rear wheel. Above this is a vertical petroleum motor which drives the rear wheel directly or through a reducing gear if desired.

The carburetor, which is located in a receptacle in the frame of the bicycle, is connected with the admission valve of the motor by means of a pipe provided with a stop-cock convenient to the rider. Another pipe, which admits air to the motor, is also easily controlled by the rider.

If the electric ignition is employed the batteries and inductive coil are attached in an out-of-the-way part of the frame. A circuit breaker enables the rider to instantly stop the spark.

The motor is of the Otto cycle, radiating ribs of copper being used to facilitate the cooling of the cylinders. These ribs, however, are not cast with the cylinder, but are fitted over it. A fly-wheel is seen behind the seat. One lever controls both the valve of the carburetor and the air valve. Another lever regulates the exhaust valve.



NEW PETROLEUM CARRIAGE OF M. MORS.

Penny Parcel Delivery by Motor Vehicles.

We are told that what has been done for letters by Rowland Hill is to be achieved in London for parcels by a new enterprise called the London Penny Parcel Delivery & Automatic Advertising Company, which proposes to place on the streets of the metropolis 1,000 tricycle carriers of novel construction, and to open, in every district, offices for the receipt of parcels. Within a five-mile radius of Charing Cross parcels not exceeding three pounds in weight will be delivered for one penny—an innovation that ought to prove a perfect godsend to the weary city man who is expected to lug home parcels in the evening, and for ladies who have to burden themselves with ungainly packages in the course of their shopping. For parcels between three pounds and six pounds it is proposed to charge 1½d., and for those between six pounds and nine pounds 2d.—the latter weight being the maximum fixed for the moment, just as operations are at first to be confined to London. For any distance beyond the five-mile radius, but within the metropolitan area, an additional penny per parcel will be charged, but it is hoped that the public patronage will be so great that the company will soon be able to carry for a penny a parcel up to 10 pounds for any distance in London. A main source of the company's revenue is expected to be found in the novel form of its advertisements. Each tricycle carrier will bear a box to hold the parcels, and on the glass sides of this box will be displayed a prominent advertisement, which will automatically change at regular intervals. These perambulating advertisements ought certainly to attract attention by their novelty, and we understand already contracts have been given by a good many of the leading advertisers.—*Automotor and Horseless Vehicle Journal.*

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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Motive Powers.

Commenting on the Marseilles-Monte Carlo race and the victory of the steam tractor, the London *Engineer*, all along the champion of the steam vehicle, says in regard to the petroleum motor:

"When we come to consider the peculiarities of the petroleum engine, we see how thoroughly unsuitable it is in many respects for its purpose. Unlike the steam engine, it cannot start until the cylinder has been heated up to the proper point. Unlike the steam engine, this occupies a considerable time. There is always delay and uncertainty in starting an oil engine of any kind. One day it may run off with a few turns of the fly-wheel; another time it may take an hour, and the expenditure of much labor and language to induce it to start. But, however excellent the firing arrangements may be, the fact remains that the engine once started must not, or at least ought not, to be stopped; and, worst of all, it has a fixed speed of revolution which cannot be widely departed from. These things are of no consequence when the oil engine is employed to drive machinery. It is started in the morning, and runs all the working day, with intervals for meals. Its load is fairly equable, and it can be run at just the speed which best suits it. The oil engine is the worst possible motor for a variable load. It is entirely out of place therefore in driving vehicles of any kind, because the load varies incessantly on all but level roads. At the Crystal Palace last year no trouble was experienced in the grounds because the cars ran on a dead level track. The hills on the Brighton road found out weak places that the Palace terraces could not detect. At one moment we have a car running down hill and requiring no power at all; the next it is toiling up a steep ascent, making maximum demands on the engine; and in the country this must go on all day. The only way out of the difficulty lies in interposing between the engine and the driving-wheels some form of variable speed gear more or less complex or expensive; and furthermore, as the oil engine cannot be reversed, the gear must be so made that it will drive the car backward. We think that great credit is due to those engineers who, working with a motor so defective, have accomplished so much. It must, however, not be forgotten in this connection that up to the present no satisfactory display of the powers of a heavy oil engine have been made. We are told indeed that more than one maker has achieved great success in this direction; but we have no tangible evidence in the way of public demonstrations to prove this; and even if he facts were all that workers in this connection believe themselves, and wish us to believe, they would not elude the fact that the oil engine is unsuitable for variable loads."

Now this of steam:

"Turning now to the steam car, we see that it is in practice exempt from the objections which pertain to the oil engine. The steam engine is eminently 'flexible;' it will run fast or slow, stop or start just as we please. Instead of emitting a small quantity of an abominably smelling smoke, it gives off at the worst only a perfectly innocent white vapor. It is a matter of common knowledge that a well made engine will run for years with little or no wear and tear. It is spared the explosive violence and the excessive temperatures proper to the gas or oil engine. Its power can be varied within very wide limits without gearing, and as it gives two impulses in every revolution instead of one in every two revolutions, its action is made more uniform. The objections to the use of steam are concentrated in the boiler, but they exist in the imagination only. The production of a light, strong, easily cleaned boiler presents no real difficulty, and it can be fired with oil fuel. Thus the stoking difficulty is entirely disposed of. The rate at which the oil is burned will be regulated by the demand for steam."

Then in conclusion:

"Let the event be what it may, we feel certain that steam will play its part with credit; and it will not be surprising if ultimately we find petroleum only used for propelling vehicles as an excellent and convenient fuel wherewith to make steam. We write of things as they are. The field for inventors is open, and perhaps we may yet have developments of the oil engine that may compel us to adopt modified views. When that time comes we shall not be behindhand with our compliments to the inventor."

Thus is a motor which has already made for itself a highly creditable record on the road, and which is destined to perform a great service, both for locomotion and for stationary purposes, peremptorily dismissed by this English authority on engineering. The advantages of the petroleum motor, its economy of fuel, simplicity, ease of management, etc., are all forgot, while the objections to the use of steam in road locomotion are declared to exist in imagination only. If this is true, why may it not also be said that the objections to the use of petroleum exist in the same region of the brain? As a motive agent steam is old and well understood, while the petroleum motor is more recent and less thoroughly understood. So far as imagination is concerned, it is more natural to cultivate this faculty in the contemplation of the subject with which we are less familiar. It is only necessary to bring to the study of recent events an unprejudiced mind to reach the conclusion that the petroleum motor has an important part to play in the motor vehicle business. Though much remains to be accomplished in detail, much has already been accomplished. But that the petroleum motor will displace all other motive powers for vehicle propulsion no careful observer will claim.

Of all the vehicle motors in the field none is entirely free from objections, and none is applicable to all the varied conditions that arise in practice. Steam has its uses for heavy haulage, electricity a growing field for urban work, and oil its advantages for long distance and general service. But this is true in all dynamics. No motive power ever discovered is preferable for all purposes. In its infancy expectations somewhat too sanguine are apt to be cherished, but practice and the competing claims of rival powers soon correct any mistakes of this kind, and the newcomer finds its proper place in the economy of the world.

It is certainly much fairer and wiser to study both the merits and the defects of the different motive powers, and assign each to its proper sphere as soon as possible. The field is the world, and no one power can fill it.

In Many Minds Is Wisdom.

READERS of THE HORSELESS AGE will be glad to observe that our esteemed contributor, M. H. Daley, has again taken up his pen to discuss the problems of the motor vehicle, and favors us in this issue with an article on the difference between horse-power and motor-power. Mr. Daley has given much time and money to experimental work in this line, and in so freely offering his experiences in aid of the general cause at a period when concealment is more natural, he sets an example that other inventors and mechanics who are pursuing the same course of investigation might profitably follow. A generous interchange of ideas is in the interest of all.

While it may be said, with much truth, that nothing mechanical is impossible to man, aided and guided by science, it is certainly true that there are an infinite number of impossible ways of doing anything mechanical, and, although there are several right ways of doing anything mechanical, we seldom find even one right way until we have tried many impossible ways.

Wheel Diameters.

In considering the diameter of the wheel that should be employed on a motor vehicle it is well to remember that we employ large wheels now because the horse's breast, from which he draws the load, is high, and because a large wheel gives a longer leverage in lifting the load over obstructions. But the pneumatic tire accomplishes this better than the large wheel, and roads are fast being improved all over the world. Then again, while the horse is capable of a strong sudden pull, he is unequal to the continued effort of the motor.

All these reflections, without taking into account the question of gravity, point to a smaller wheel as more desirable for the motor vehicle.

Our patent department in the present issue is not wanting in signs to show that the agricultural motor is now receiving attention from American inventors. The time is ripe for its development. In the present depressed state of agriculture our intelligent farmers will gladly welcome any mechanical improvement that will enable them to harvest their crops more economically. The great grain fields of Russia, India and the Argentine Republic also offer a market for inventions of this class.

Canada's First Motor Vehicle

The credit of owning the first motor vehicle in the Dominion of Canada belongs to F. B. Featherstonhaugh, patent solicitor, Toronto. This vehicle, which is modeled on the lines of the hansom cab, can be closed in front when required by means of a flexible, transparent, celluloid blind. The vehicle has been constructed from Mr. Featherstonhaugh's design and under his own supervision. It is mounted on three pneumatic-tired bicycle wheels of especially strong construction, and is braked by a foot-brake operating on a drum on the driving axle.

The electrical equipment is the invention and production of W. J. Still, of Toronto, and is covered by patents issued and applied for. It consists of a battery of 12 cells, a motor of about four maximum horse-power and a series-multiple controller. The cells are of the lead-lead type, and contain about 140 ampere hours at a five-hour discharge rate; their average voltage being about 1.9 for the entire discharge. This equals a capacity of 266 watt hours each, or a total of 3,192 watt hours, or 4.27-hp hours. They weigh each 23¼ pounds, or a total of 279 pounds, equivalent to a weight of about 66 pounds per hp-hour.

This light weight of the batteries is due to the peculiar design of the plates, they being constructed of a spiral ribbon of a special highly compressed lead sustained by non-metallic supports so as to admit of the free expansion and contraction of the active material without any strain or disintegration. While exceedingly permeable, and permitting an uninterrupted circulation of the acid, no buckling and short circuiting of the plates can occur. This gives them an exceptionally high discharge rate, without an abnormal drop in potential, and enables them to maintain an immense output without injury.

The motor, which is of the disc armature type, is six-polar, the fields being series wound; the commutator is of the flat type, and the current is supplied by six copper brushes running on end. The efficiency of the motor is extremely high, its electrical efficiency on ordinary roads being about 93 per cent., and it is fused for about 250 amperes of current. It will develop up to four horse-power without heating, and is absolutely sparkless under ordinary working conditions. The weight of the motor is about 100 pounds., and it is journaled on the main driving axle and geared to it by a gear of 12 to 1; a differential gear is employed to permit different rates of speed in the two driving wheels when turning corners, and the motor is spring cushioned to prevent sudden strains to the gears when starting. The controller is of the series-multiple type, and has three positions, 6, 12 and 24 volts, and contains a separate reversing cylinder operated by a small lever. The head lights are illuminated by small incandescent lamps, fed from the battery and controlled by separate switches. The vehicle is steered by the same handle as controls the speed, and is so nicely adjusted that it may be readily turned by a very slight pressure.

The total weight of the vehicle is about 700 pounds, of which not more than 279 pounds is weight of battery, the type of rig being comparatively a heavy one.

The batteries used in conjunction with the electric vehicle described in the foregoing article were designed especially for the high discharge rate work required for electric rail traction, such as interurban and locomotive railway work, where it would be simply impossible to carry battery power, even with such light cells as Mr. Still's to supply power for any great length of time.

Mr. Still claims that he can make cells of his design that will not weigh more than 90 pounds per horse-power on one-hour discharge rate, thus making a battery that will develop one horse-power for one hour at a weight of 90 pounds.—*The Canadian Engineer.*

The Marseilles-Monte Carlo Race.

The three days' race for amateurs (*chauffers* as they are termed in French), between Marseilles and Monte Carlo, was run early in February under distressing weather conditions. The roads were in bad condition and a strong and disagreeable wind blew during the entire course, but notwithstanding these obstacles better time was made than in the Paris-Marseilles-Paris race last Fall.

The course of 150 miles was divided into three stages, the first 95 miles, the second about 45 miles, and the third about 10 miles.

The competing vehicles were divided into two classes, motor carriages and motor cycles. Thirty-seven vehicles started, twenty-eight carriages and nine cycles. Many accidents occurred during the course in consequence of the bad roads and the carelessness of the contestants or sightseers,

although for several days prior to the race notices had been posted by the mayors of the various towns *en route*, requesting citizens to keep children and dogs out of harm's way.

Count de Chasseloup-Laubat who drove a De Dion steam tractor, arrived at the terminal first, having made an average of 21 miles an hour. M. Lemaitre, who operated a vehicle manufactured by Panhard & Levassor, made over 20 miles an hour.

The final result for the three days, distance 150 miles, is as follows:

VEHICLES.

	Nos.		H.	M.
1	73	Chasseloup-Laubat	7	45
2	21	Lemaitre	8	17
3	39	Prévost	8	26
4	17	De Knyff	9	5
5	51	E. Giraud	9	24
6	25	A. Michelin	9	35
7	7	Gauthier	9	47
8	49	Henri Peugeot	9	48
9	1	Leveilly	10	10
10	35	Bruninghaus	10	15
11	79	Egrevi	11	51
12	37	Cahen	11	56
13	57	Peter	11	58
14	43	Beauvais	12	24
15	41	Sibilat	12	50
16	83	Courtois	12	50
17	23	Petrus	13	20
18	3	Millaud	13	29
19	81	Dravet	14	20
20	9	Laumaillé	14	29
21	63	Bicycle-Club Lyon	18	6
22	65	Dupré-Neuvy	18	16
23	33	Salhmard	19	29

MOTOCYCLES.

	Nos.		H.	M.
1	22	Chesnay	9	23
2	14	Marcellin	9	40
3	28	Vte de Soulier	9	46
4	24	Mouter	10	13
5	4	Rivierre	10	29
6	6	Gabassus	10	33
7	41	Nicodémi	10	45

It is said that the Benz vehicles, which have already been described in THE HORSELESS AGE, made a very creditable average, as has been the rule in all contests previously held.

The London Electrical Cab Company.

At a general meeting of the London Electrical Cab Company, held Jan. 29, the chairman, H. H. Mullinet, stated in answer to questions from shareholders that time is required to build a considerable number of cabs for commercial purposes, that £63,000 had been paid in by subscribers and that 24 cabs would be put out as the first installment, to be followed by others as fast as they could be completed. The chairman's opinion was that electricity would be the future motive power for street traffic in London. As regards electric vehicles for private owners, he was not at all sanguine of their success, nor was it within the company's program to introduce them for this purpose. On this subject he said:

"It might happen in a few cases that persons could do this, but they would have to have considerable expensive electrical apparatus, and they would also have to have a competent electrician to deal with the necessary charging, etc. Further than this, as the cost of electricity depends upon the amount which is used, the supply would prove very expensive, and no makers of accumulators would probably be willing to guarantee the accumulators to individual persons, as there would be considerable doubt as to their being properly looked after. But I have the very greatest belief in electricity as the future motive power for street traffic in London, where, in cases like the London Electrical Cab Company, it can be organized on a thoroughly business-like basis, *i. e.*, where you can have one experienced man responsible for the charging of the accumulators, and where you can contract with the supply companies and the accumulator makers, and where you can have exactly the apparatus necessary for taking the accumulators on and off, etc. Then the drivers need have no knowledge at all of electricity, and have nothing to think of except conducting the vehicles, every precaution having been taken to ensure that these drivers should not be able in any way to interfere with and so possibly damage the electrical apparatus."

New Motor Boat Works on the Harlem.

On the Harlem River, at Morris Heights, 177th Street, New York City, lies the new plant of the New York Yacht, Launch & Engine Company, a corporation recently organized to manufacture power boats and Wing's marine gas motors for driving the same.

The property acquired by the company covers two acres of ground and has a frontage of 200 feet on the Harlem River. Running along the shore is a building 60 x 300 feet, equipped with the necessary machinery to build all sizes of boats, from the row boat to the largest yacht. Excellent facilities are also offered for the repairing and storing of boats.

Among the orders taken during the past week, the company report one for a 50-foot business boat propelled by two 12-hp Wing motors, twin screw; another for a handsome 30-foot cabin launch, driven by an 8-hp Otto motor, and a 6-hp Wing motor for an auxiliary to a yacht now in course of construction in Rhode Island.

This company has also taken the general selling agency for the Otto marine gas engines, now made up to 100 horsepower.

The down-town office is at 109 Liberty Street.

Suspension Wheels.

Charles B. King, Detroit, Mich., manufacturer of the King motor, is now placing on the market a suspension tangent wheel, specially designed for motor vehicles. The advantages which are claimed for these wheels are that they are built to stand the torsional strain of the motor and have no tendency to buckle, like a direct spoke wheel. It is stated that a 25 pound tangent wheel with rims for three-inch pneumatic tires will safely carry a load of 3,500 pounds over ordinary roads. These wheels are supplied for all styles of carriages.

At a test of the No. 2 Twin American Motor recently made at the company's factory in Hoboken, N. J., by the mechanical expert of a critical purchaser, one of the motors alone was found to develop as much power as the expert had previously estimated for both.

The Motor.

The Horse-Power Required.

BY M. H. DALEY.

A careful consideration of the question of power will show that what we consider a nominal horse-power is only the surplus power that a horse may exert in ordinary labor over and above the power necessary to carry itself.

A nominal horse-power, being a force sufficient to lift 33,000 pounds one foot high in one minute, or 50 pounds 660 feet high per minute, a horse can draw a load that will register a pull of 50 pounds, traveling at a speed of 660 feet per minute, or seven miles per hour. It is evident the horse has to carry itself besides drawing the load.

M. H. DALEY.

Experience teaches that it will take two horses to draw a load, weighing as much as one horse, at a rate of seven miles per hour. Therefore it takes two nominal horse-power to carry the horse and one nominal horse-power to draw the load.

If we suppose the horse to weigh 1,200 pounds, and to pull on a good road 600 pounds at a speed of seven miles per hour, one nominal horse-power will draw 600 pounds. The horse has exerted three nominal horse-power in carrying itself and drawing the load, one available horse-hower to draw the load and two horse-power to carry itself. To draw this load at twice the speed it will require two nominal horse-power if it be drawn by the motor ; but two horses could not do it at 14 miles per hour, as more of the horses' power would be required to carry themselves

Therefore for high speed the motor carriage is more economical than the horse-drawn carriage.

If we double the speed to 14 miles an hour the horse would need four nominal horse-power to carry itself without any load. This we know to be true, as no horse can stand a speed of 14 miles per hour, and in traveling at that speed for even a short time the horse exerts itself more than in drawing a nominal horse-power at seven miles per hour.

If we drive a horse at 3½ miles per hour it will only require a nominal horse-power to carry the horse, and we have 2 nominal horse power available to draw the load, and at 1¾ miles per hour it takes only ½ a nominal horse-power to propel the horse, and we have 2½ nominal horse-power available. Therefore we have 3 nominal horse-power available on a standing pull to start a load. But as the horse often doubles its ordinary exertion in starting a load, we have an available strength of a 6-hp motor, even if the motor runs at full speed, and is geared to start the carriage slowly. All the advantage a 6-hp motor would have would be the power stored in the balance wheel.

A year ago we were trying to make every part of the motor and carriage light. We reasoned that if two horses could draw a carriage and two people at a speed of seven or eight miles per hour, a two-hp motor would be sufficient for a single-seated motor carriage. Experience has proven the fallacy of such reasoning.

Millions of dollars have been spent in constructing light motors from one to three horse-power and carriages of light weight, only to find our time and money have been spent simply for experience.

In constructing a motor carriage it is necessary to consider that besides carrying two men and the carriage the motor must also be carried, and in order to do this the carriage must be stronger and necessarily heavier than those used for horses, and the motor must be of sufficient horse-power to propel this heavier carriage on bad roads and up hill.

In figuring the power required to propel the motor carriage we have not taken these facts into consideration. We have thought of the horse when we made a two-horse motor, and considered it as powerful as two horses. This might be true at a speed of seven miles per hour or a mile in nine minutes. But as soon as the speed is reduced below this the horse is enabled to exert more of his power in available work and in starting the load he can exert practically all his power. It is evident that the power of a horse is much greater than a nominal horse-power of the motor at slow speed as on bad roads, in hill climbing or in starting the load.

By having variable speed the motor may run at full speed to move the carriage slowly and give more power. But experience proves that we have underrated the available strength of the horse, and that an eight hp motor is necessary to draw a load that two horses usually draw, when we add to the load the motor and the necessary strength of carriage to carry it. Hence the necessity of a more powerful motor.

I consider the motor the most essential part of the motor carriage, and have spent considerable time in experiments looking to the production of a powerful motor of light weight.

Experience teaches that we have expended too much effort in trying to lighten the motor. The lighter it is made the more vibration will be felt. Common cast iron is best suited for cylinder and water jacket, which should be cast in one piece. The balance wheels should be heavy. There is no economy in light balance wheels.

Thin steel cylinders are not so good as cast iron, because the high temperature of the explosion overheats the cylinder, while cast iron, being heavy, is not affected by the sudden flash.

Now as to the form of the motor. From what experience I have had I consider a double-cylinder gasolene motor the best, with the following construction : Two cylinders, on opposite sides of the crank-shaft, connected to a circular base that en-

closes the working parts and prevents oil from getting outside; two cranks placed opposite or at 180 degrees, with a connecting rod from one piston to one of the cranks, and from the other piston to the other crank; brass crank boxes dipping in oil as they revolve. There must be an opening on top of sufficient size to allow access to the cranks. This opening must be covered to prevent oil from getting out, and the cover should be securely fastened. A pipe should extend up from the cover to allow air to go in and out without letting out the oil. The pistons should travel the full length of the cylinder, so as to force out all the gas mixture from both cylinders into an explosion chamber.

There being only one inlet valve, one outlet or exhaust valve and one set of electrodes, this double-cylinder motor has no more mechanism than the ordinary single-cylinder motor.

In summing up our experiences gained from actual tests we must conclude that we are slowly getting at the facts necessary to the practical development of the motor carriage, to wit. That weight is necessary in the construction of the motor; that six or eight horse-power is necessary to successfully propel a light carriage; that 800 pounds is light enough for a single-seated two-passenger carriage and motor; that strength and durability should not be sacrificed in order to make a light motor or carriage; that the balance wheels should be heavy and strong and securely fastened to the shaft; that there is as much difference in gasolene as there is in men; that good gasolene and good management are necessary to the successful working of the motor.

Riker Electric Carriage for Four.

The latest form of the Riker electric vehicle is of the trap style, and is capable of a speed of 10 miles an hour for four hours over good roads.

A single motor geared direct to the rear axle and developing three horse-power at 1,000 revolutions per minute, is used instead of the two motors with which the previous carriage was fitted.

Forty-four cells of storage battery specially designed for traction, supply the current. These cells are placed in crates, each containing a number, so that discharged cells may be replaced by fresh cells in about two minutes.

The vehicle is controlled by a lever at the left hand side. When this lever is in an upright position the carriage is stopped. To go ahead the lever is pushed forward. The further it is pushed the greater the speed. To back the carriage the lever is reversed.

A powerful brake with an automatic cut-off instantly stops the current in an emergency.

Pneumatics of three inches diameter are used, the front wheels being 32 inches and the rear wheels 36 inches.

The weight of the vehicle complete is 1,600 pounds.

The Walton Power Transmission.

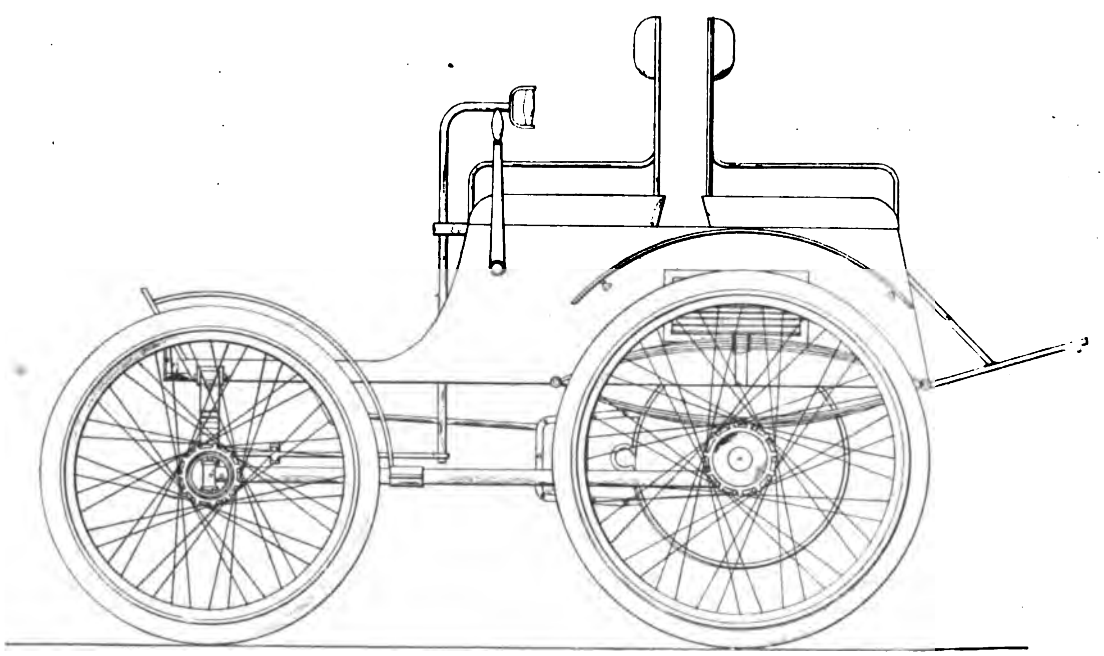
W. G. Walton, of Hamilton, Ont., president of the Hamilton & Barton Incline Railway Co., contributes to the current issue a method of transmitting power in motor vehicles, which he has just completed.

It is attached to a King motor which, when running at 500 turns, gives from three to 24 miles per hour. The differential gear is attached to the horizontal bar back of the front axle, which moves the front wheels on the axle joints.

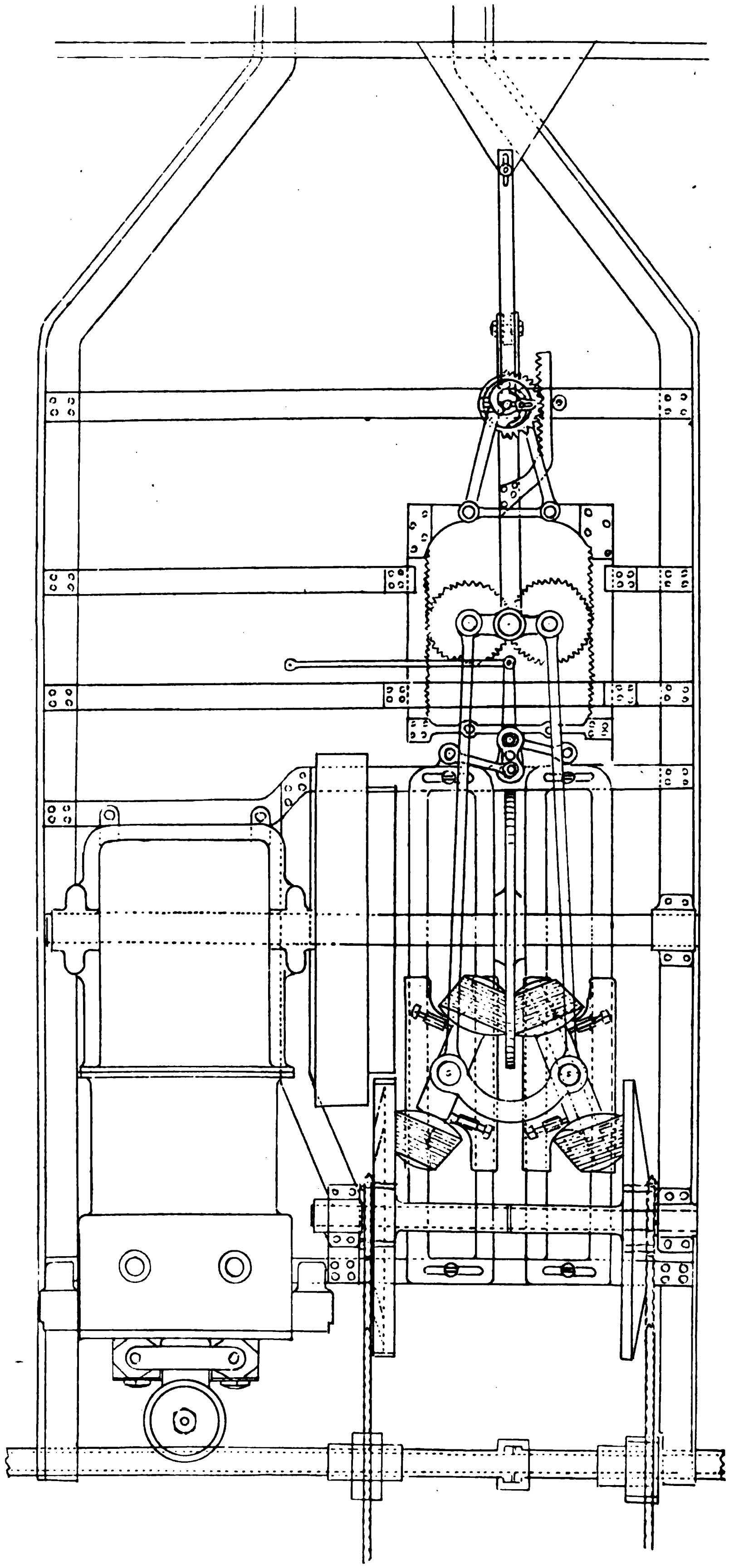
Sprockets and chains are shown in the print, but gears can be employed if desired, the inventor himself preferring them to the sprocket and chain.

The backing attachment, which is not shown, is said to be simple. The movement for tightening the friction wheels is attached to the backing device and the steering post is so attached that one lever only is required.

All the machinery is hung on the frame separate from the body so that no vibration or jar will be felt on the body.



ELECTRIC TRAP. RIKER ELECTRIC MOTOR CO., BROOKLYN, N. Y.



WALTON POWER TRANSMISSION.

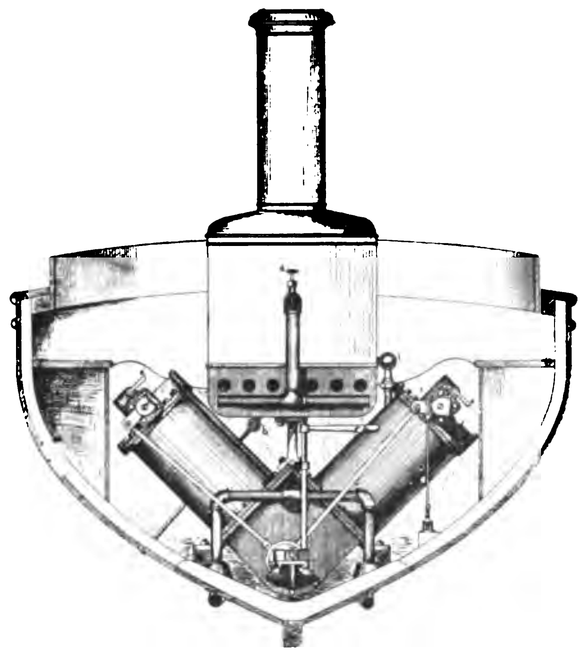
The Ofeldt Marine Vapor Motor.

The new and improved vapor motor, invented by F. W. Ofeldt, foot of Twenty-Fifth Street, South Brooklyn, N. Y., being now in shape for inspection, the editor of THE HORSELESS AGE paid a visit to the works recently to see it.

Several sizes were exhibited, the smallest of three horse-power and the largest of 50 horse-power, the former weighing 160 pounds complete and the latter 1,600 pounds.

Motive power is obtained by expanding a very low grade of alcohol in a boiler or retort made of small coils of pipe arranged inside of a square casing. This boiler is placed above the motor and securely fastened by braces.

The motor consists of two separate engines, each consisting of two separate cylinders one twice as large as the other, thus forming a compound engine. These pairs of cylinders are constructed at an angle of 90 degrees to each other.



Inside the box or crank case is a double crank, the two high pressure connecting rods being fastened to the further crank and the low pressure rods to the near crank.

Fuel consists of naphtha of 76 degrees test, contained in a tank in the bow of the boat. This tank is separated from the rest of the boat by a water-tight bulkhead, and the fuel is pumped through a small pipe running along the bottom of the boat and coming through the skin just aft of the power plant.

The motor has a double crank house, no dead centre, and will start in two minutes. Any desired horse power can be built under this system, the consumption of fuel averaging one quart per horse-power per hour.

In the accompanying illustration

B is the naphtha supply valve.

A is the reversing lever.

C is the naptha lever.

D is the injector used for mixing the naphtha, gas and air.

E are the pass-over valves.

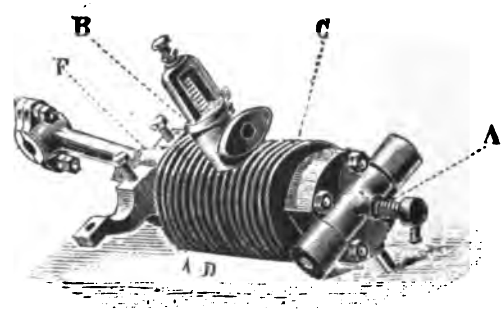
F is the feed valve, ensuring a positive boiler feed.

The "Loyal" Motor and Tricycle.

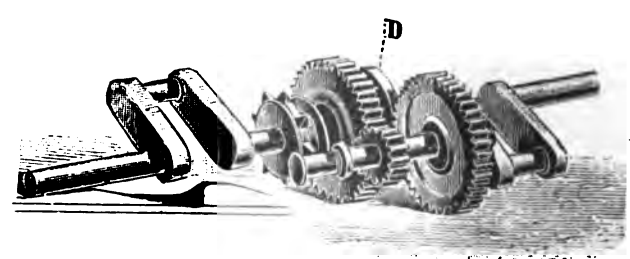
We reproduce from the *Autocar* a brief description of a motor and motor tricycle of the above name, hailing from Paris.

It is a two-cycle motor as opposed to the Otto or four-cycle, and consists of a cylinder *C*, a piston *F*, an inlet valve *A* and an exhaust valve *B*.

Let us suppose the piston is at its lowest point, the explosive mixture being drawn in and compressed in the bottom of the cylinder. It is then inflamed, and as soon as the explosion has taken place, the piston is driven forward, uncovering an exhaust valve placed under the circumference of the cylinder. This valve allows a certain amount of burned gas to escape



and the piston going out sucks in a volume of the new gas equal to that escaped; the ejecting valve only allows the surplus of the exploded charge to escape. The new is always mixed with a quantity of the burned gas from the preceding charge. Hence the new gas becomes very hot and is said to ignite automatically on the return of the piston.



To start the motor a lamp or an electric spark is used for a few moments.

It is claimed that the explosion takes place at the very moment when it is most effective, and that the consumption of fuel is comparatively light, rendering the use of the water jacket unnecessary, a few cooling ribs sufficing.

The tricycle to which the Loyal motor has been attached is also illustrated. Two motors propel it, each balanced to work alone in case of accident.

Regulation is effected by the tension of the valves *A* and *B*, which when worn are easily replaced.

The speed gearing, designed in this particular instance for racing, is worked by a simple lever which displaces a pinion carrying a friction cone. In the case of a sudden effort the cone is allowed to slip, preventing breakage.

It is said that this experimental tricycle has been ridden up hills of 12 per cent. grade at a speed of six miles per hour, and on level roads, where it was possible to employ the friction, at 25 miles per hour.

The inventor, it is stated, has a three-hp stationary motor running in his factory without a water jacket and with an economy of fuel, quite unprecedented in the history of the single-cycle gas engine.

The Société des Générateurs Serpollet, Paris, makers of the Serpollet steam vehicles, report quite a number of orders for pleasure carriages.

The Bergmann Motor Carriage.

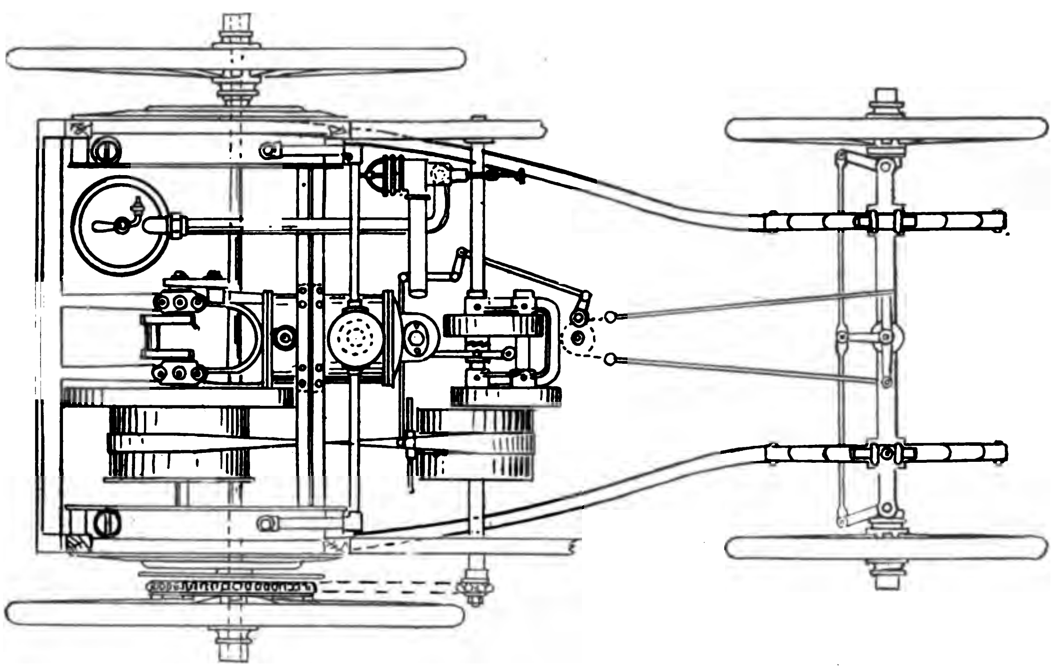
Theodore Bergmann, Gaggenau, Germany, has taken out patents in all the civilized countries on a motor carriage, having a number of novel features. One of these carriages is now on the way to the United States, consigned to the American Motor Company. who have secured the patents for the United States.

The carriage, which weighs about 1,000 pounds, is intended for two passengers. The framework is of tubular steel, and and pneumatic tires are used on the front and cushion tires on the rear wheels. The front wheels are 28 inches in diameter and the rear wheels 40 inches.

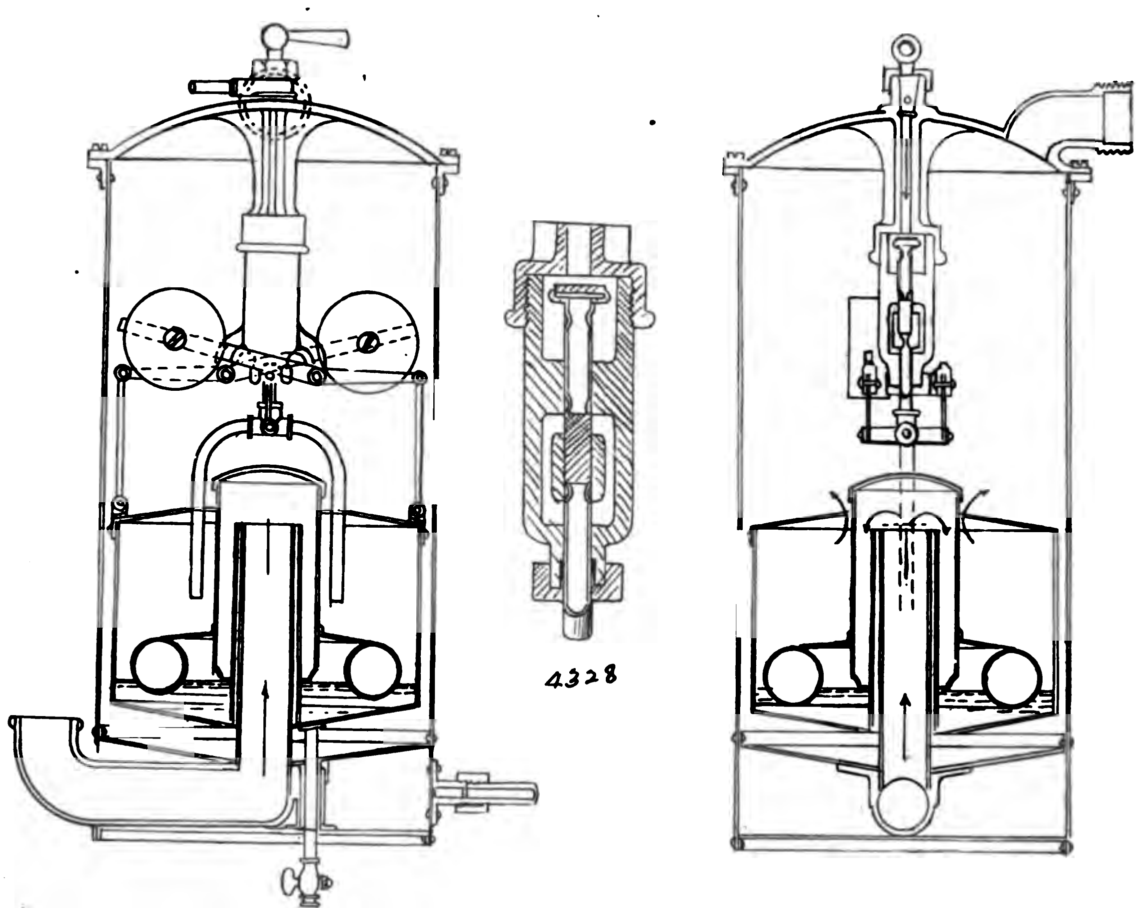
The single cylinder horizontal motor, developing 4 horsepower and weighing 300 pounds, has a 6½-inch stroke, at a 5-inch diameter of cylinder, and makes 400 revolutions per minute. It is of the ordinary Otto cycle.

One of the novel features of this vehicle is the carburetor, which contains a controlling mechanism adjusting itself automatically under all conditions of road, so that a constant mixture is supplied to the motor. This consists of a vessel containing gasolene and suspended on levers inside a receptacle. The vessel is counter-balanced by weights on the levers, or arranged as a float, provision being made for an admission valve for the liquid, an inlet for the air, and a float for effecting the admixture of the air and gas, at approximately the same height above or below the level of the liquid. This vessel may be placed on a spring for retarding its downward movement, and closing the valve when the vessel receives an excess of liquid. The valve regulating the inlet of the liquid is pressed on its seat by a spring mounted on an extension of the valve spindle, which, when the valve closes, can slide further independently while the disc keeps the valve tightly closed. A double mixing valve secures the even composition of the explosive mixture at each opening of the regulator, the width of passage for the gas mixture, which is always in the same proportion to that for the air, being regulated by a revolving slide.

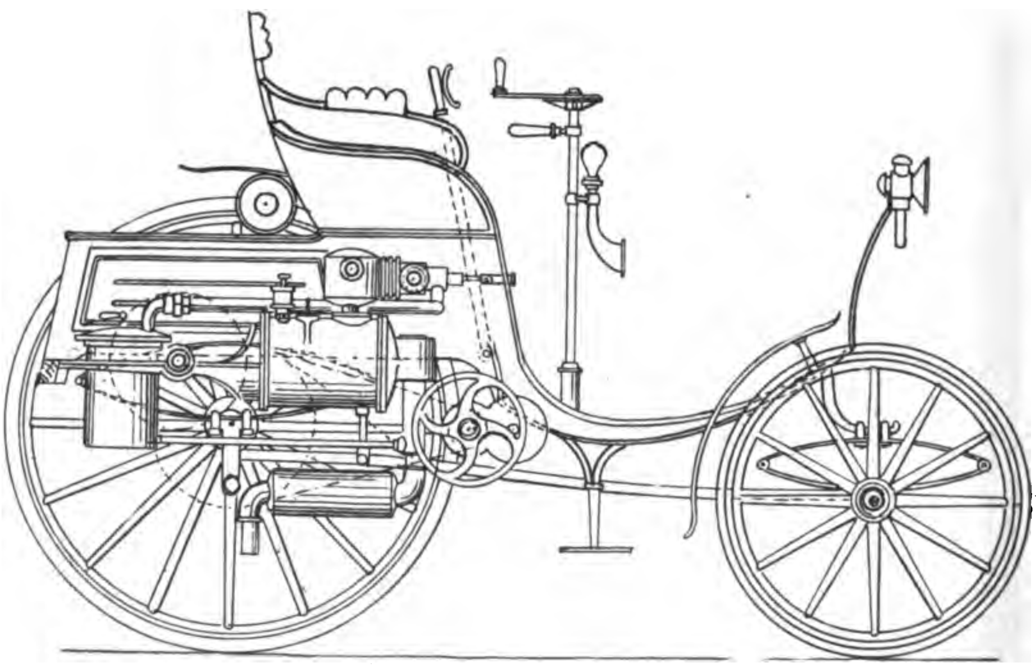
The cylinder is kept cool by water kept in tanks in each side of the vehicle. A condenser, composed of a series of small pipes designed to expose as much surface as possible to the air, is placed underneath the motor, and serves to condense the steam from the overheated water. The water is then returned, through pipes, to the tanks, whence it passes again to the cylinder.



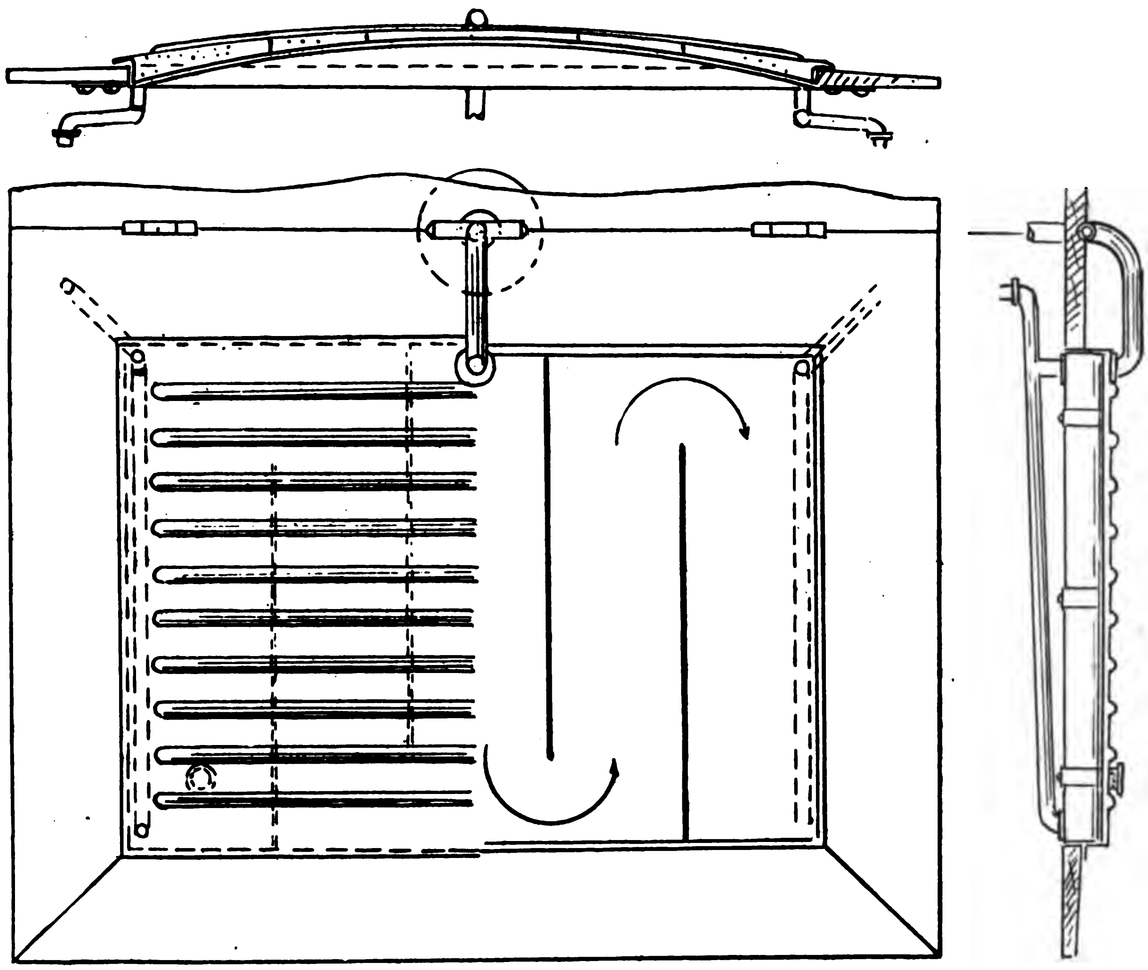
PLAN OF BERGMANN MOTOR CARRIAGE.



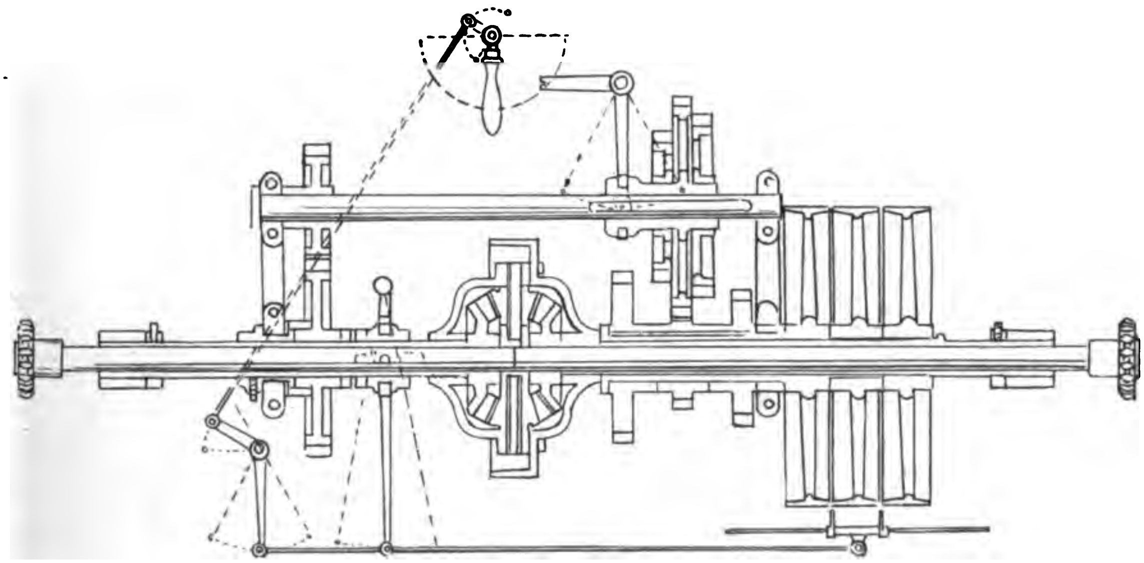
CARBURETER OF BERGMANN CARRIAGE.



ELEVATION OF BERGMANN CARRIAGE.



CONDENSER.



TRANSMISSION.

Another interesting feature is the transmission, which is accomplished with only one belt, giving three speeds, one on the driving pulley and two by means of gears working on the driven pulley.

Two levers are used, one to steer and the other to regulate speed. The steering axle has wheels pivoted at the hub.

The electric ignition is employed, but no differential gear, power being applied to one wheel only, by means of a sprocket and chain.

The New York Cycle Show.

The Annual Bicycle Show, held Feb. 6 to 13, at the Grand Central Palace, New York, was of secondary interest only to the motor vehicle student. Contrary to expectation, no motor vehicles of any kind were on exhibition, though the Winton Bicycle Company, of Cleveland, O., distributed a circular descriptive of their experimental carriage, already shown in our columns, and announcing their intention to manufacture motor carriages on a large scale in the near future.

Several other bicycle manufacturing concerns were found, on inquiry, to be either carrying on experiments with motors or closely watching the development of the new art, with the intention of taking an early hand in the game.

Among the manufacturers of parts, particularly tubing and tires, preparation for the demand now springing up from builders of motor vehicles was generally noticeable in the larger sizes, which can now be obtained in both lines.

The Weston-Mott Co , Jamesville, N. Y., exhibited one of their wire carriage wheels already described in THE HORSELESS AGE, while of lamps, kerosene and electric, there was bewildering variety, manufacturers in many cases furnishing dash lamps as well as cycle lamps. An acetylene lamp called the "Wizard" was the chief novelty in this line.

Wire spokes made of Carbondale rustless metal and said to be as strong as steel, were shown by the United States Cycle Fittings Company, 256 Broadway, New York.

An exhibit of interest to motor vehicle builders was the Waverley Dynagraph, an instrument for registering the friction of bicycle and other vehicle bearings, invented by C. E. Hadley, mechanical expert of the Indiana Bicycle Company, Indianapolis, Ind.

The object of this invention is to afford the mechanic an accurate, graphic test of the amount of friction produced in a bearing.

The machine is mounted on an iron frame, which in turn rests on a box pedestal. A knife-edged attachment is placed on each end of the axle of the wheel to be tested, which then rests on a hardened steel block on the top of the frame. The record card, an oblong strip of cardboard 6 inches by 1¼ inches wide, is fastened by spring clamps to the moving plate in the exact centre of the machine which is dropped by an escapement movement actuated by the rotation of the wheel whose bearings are being tested, each revolution of the wheel dropping the plate one tooth of the rack cut along its edge. The heavy dark blue vertical line printed upon the card represents the record which would be made by an absolutely frictionless bearing, and the pencil by which the record is made on the card would describe a line identical with this one, were there no friction in the bearings tested. As friction is developed the lever arm to which the pencil is attached is thrown to a degree corresponding to the amount of friction existing, causing thereby an approximately perpendicular line upon the card, being nearer or further away from the standard line, according to the amount of friction in the bearings under test. The speed of the drop of the card is indicated by another pencil point carried on a ratchet wheel, which is actuated by a pawl on the end of a pendulum stem. The spaces marked by horizontal lines across the card are made by a pencil to vary in width according to the descending plate, wider spaces indicating higher speed in the revolution of the wheel, this point being, of course, necessary to make proper comparison. The lines upon the card which constitute the record of the test may be easily read. The relative amount of friction in different bearings is gauged by the relative degree of nearness with which the record line conforms to the bearings. In other words, the nearer a bearing comes to registering a straight line on the card, the better its construction and the less its friction.

The Cooper Machine Works, 128 Adelaide Street, East Toronto, Canada, are devoting their entire attention to the construction of gas, gasolene and oil engines for stationary, marine and vehicle uses.

WAVERLEY DYNAGRAPH.

CORRESPONDENCE.

A Correction from the Pacific Coast.

TACOMA, WASH., Feb. 10, 1897.

Editor Horseless Age.

DEAR SIR :—The statement made in the January number of your paper that the Daimler Motor Company have taken an order for the largest motor boat ever constructed is not correct. Mr. Fair, of San Francisco, has a sea-going yacht 128 feet long propelled by a 100-hp motor. The boat was built at Seattle, Wash., in 1895, and the motor was constructed at San Francisco. The motor was not satisfactory at first; it broke down on the run from Seattle to San Francisco, and the boat was picked up by a tramp steamer and towed into the Columbia River, but at the present time the motor is giving good results.

Hoping that you will excuse my interference, I am,

Yours respectfully, CHAS. H. ANDERSEN.

Vehicles for Cripples.

Editor Horseless Age.

DEAR SIR :—Could not some of the inventors of horseless carriages find a market for their inventions if they would turn their attention to a low vehicle for cripples ?

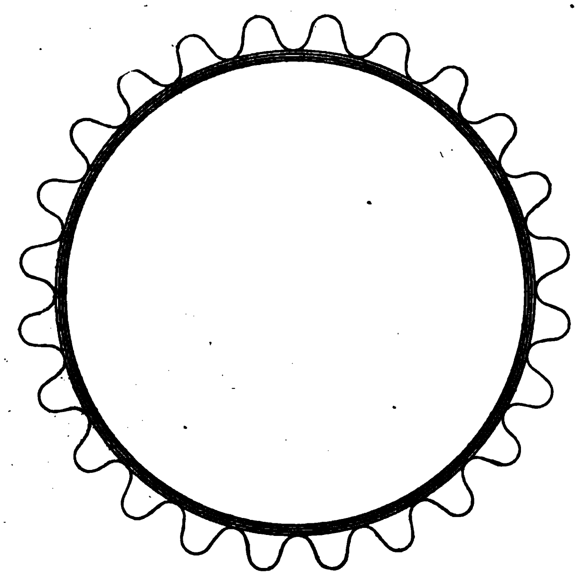
There are plenty of chairs for cripples which can be wheeled about the room by the patient and in which the cripple can be pushed on the street, and there is also a firm in Elyria, O., which makes tricycles for cripples All their tricycles go slow, and in going up hill or on soft roads are very fatiguing, if not useless.

Now I think a motor tricycle or quadracycle could be invented, made easy of ingress and egress, which would carry the cripple up hill and over soft roads at the same speed as an ordinary gentle horse. Many makers of horseless carriages say their carriages can be guided by and managed by children. If their statements are true (and I do not doubt it) such a vehicle as I have here proposed could also be made as easily manageable. The cripples could then see much pleasure of which they are now deprived and with the same ease as able-bodied persons, and not only themselves but their friends, on whom many of them depend for support, would also be less concerned about them. It would also open new avenues for their support.

Having been a cripple all my life, being over 60 years old, and getting worse every year, I know the sufferings of many of them, and I will gladly welcome any invention that will relieve their inconveniences. The firm in Ohio, which I have named, has relieved many cripples of their inconveniences, but motor carriage makers can do more, and I hope they will soon put their inventions on the market.

I also think we will have to use iron or some other metallic tires if motor wagons come into general use. I have found rubber tires expensive and annoying.

They are constantly coming off, being cut or wearing out. Something more substantial will have to be substituted. They are noiseless and elastic, but expensive. The plain iron tires of carriages drawn by horses will not do if attached to the driving wheels of motor carriages. They will slip.



I think an iron-crimped tire could be made which would answer the purpose. When they wear smooth they could be replaced by new ones, or perhaps a machine could be invented that would recrimp them. I herewith furnish a sketch to illustrate my theory.

If my theory is wrong let some reader of THE HORSELESS AGE kindly reply over his proper name and address.

ELMER, N. J. EDWIN COOMBS.

The Wolseley Three-Wheeler.

The Wolseley three-wheeled motor vehicle is thus described by an English contemporary :

"The two riders sit back to back, and the front one drives and steers the vehicle by means of a long bath chair handle. The frame is tubular, and very cleverly designed. The motor is a two-cylinder one ; the cylinders are water-jacketed, and the tank for the cooling water is beneath the seat of the front driver. Each cylinder drives direct on to a crank pin, fixed one into each of the two fly-wheels. The gearing for speed, power, etc., is of a special design, and all of the machinery is concealed in a case beneath the seats, the sides of the case being lined throughout with thin sheet metal, so that the wood cannot be spoiled by getting soaked in oil from the motor or bearings. The small box just behind the steering wheel on the foot-board contains a small storage battery for supplying current for the electric ignition. A lever is conveniently placed by the side of the driving seat, and by this one lever the carriage can be thrown into forward or backward gear, and the brake also applied. Cast steel is used for the motor frame, and aluminum for the bed plate. The manufacturers are the Wolseley Sheep Shearing Machine Company, Ltd., Alma Street, Aston, Birmingham."

MOTOR VEHICLE. CHAS. H. BARROWS, NEW YORK.

FIRST SCOTCH MOTOR CARRIAGE. (FROM THE *Autocar*.)

The Barrows Motor Vehicle.

The experimental motor vehicle on which C. H. Barrows has been engaged for several months was tested on the New York streets recently with results very satisfactory to the inventor

Power is derived from 16 cells of a special storage battery, invented by T. D. Bunce. of the Storage Battery Supply Company, 239 East Twenty-seventh Street, New York. These cells are placed part under the seat and part over the forward driving wheels. Each cell weighs 14 pounds, and the entire set is capable of a discharge of 24 amperes for two hours and 40 minutes, or 50 amperes in an emergency.

A 1-hp Riker electric motor of 79 pounds weight, which will sustain a 2-hp discharge for two hours, communicates the power to the friction pulleys which act upon the rims of the forward drivers.

The control is managed by one handle and the weight of the entire outfit is 500 pounds.

Neither of the two persons who rode in the vehicle and operated it had had any previous experience in handling it.

The Third Mueller Carriage.

The Mueller Manufacturing Company, Decatur, Ill., have recently completed their third motor carriage, designed for service on ordinary roads.

In style it is similar to a trap. The motor, which is of four horse-power, is of the high-compression Otto type and has two cylinders. The wheels have pneumatic tires and Hyatt roller bearings.

Odor and vibration are said to be eliminated.

In front of the dash is a condenser for cooling the water from the cylinders.

The transmitting mechanism is a combination of gears and chains, giving three speeds forward and one backward, ranging from three to 20 miles an hour.

The name "Mercury" has been adopted for this vehicle by the makers.

FOREIGN NOTES.

Under the leadership of Jacob Lohner, the well-known carriage builder of Vienna, an automobile club is to be organized in the Austrian capital.

E. J. Pennington writes that he will return to the United States in a few weeks to establish a plant here for the manufacture of his motor vehicles.

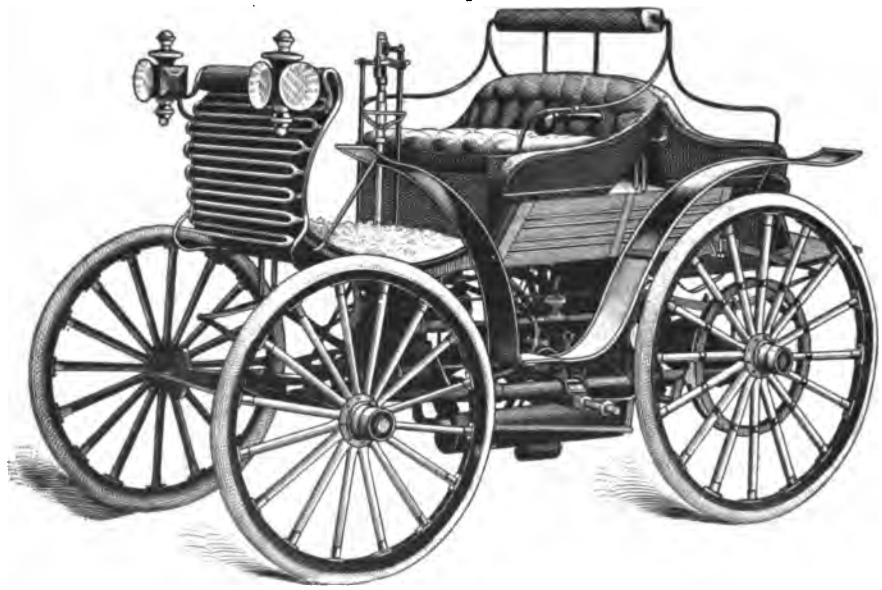
The London Motor Van & Wagon Company, Ltd., has been organized with a capital of £300,900, in £3 shares, to manufacture motor business vehicles propelled by electricity, oil or steam. The secretary's office is at 6 Old Jury, London, E. C.

J. & C. Stirling, coach builders of Hamilton, N. B., Scotland, have the honor of building the first motor carriage in that country. The motor was supplied by the Daimler Motor Co., Coventry, England, but all other parts were constructed by the Stirlings.

H. von Berestyn, Brummen, Holland, wishes to build up a general European agency in American bicycles, motor vehicles and machinery adapted to the European market. He intends to make his headquarters at Brussels, Belgium, and states that he can furnish first-class American references to inquiring parties.

The *Automotor and Horseless Vehicle Journal*, London, England, is issuing a little diary and memorandum book prefaced by a large amount of useful information in regard to motor vehicles, such as the new rules regarding the use of motor vehicles in England, facts about petroleum, tables of weights and measures, motor vehicle tests, and lists of firms and companies now identified with the new industry in England and France.

The editor acknowledges the receipt of catalogues from the following foreign manufacturers: Rochet & Schneider, Lyons, France; Société Anonyme des Automobiles Peugeot, Mandeure near Doubs, France; E. Rossel, Lille, France; Panhard & Levassor, 19 Avenue d'Ivry, Paris; Louis Herlicq, 59 Rue de Flandre, Paris, manufacturing under the Capitaine patents; De Dion & Bouton, 12 Rue Ernest, Puteaux (Seine) Paris, and Michelin & Co., makers of the well-known Michelin pneumatic tires.



MOTOR CARRIAGE. H. MUELLER MFG. CO., DECATUR, ILL.

Louis Lockert, formerly editor in chief of *La France Automobile*, has resigned, and will henceforth issue a bi-monthly journal on the same subject, entitled *Le Chaffeur*, with offices at 26 Place Dauphine, Paris.

Accles, Ltd., Birmingham, England, proprietors of the Holdford Works, one of the best equipped plants in England, have taken a sample order for 1,000 motor cycles, and intend to enter largely into the manufacture of them before the close of the year.

A. E. Hodgson, of Harrison Road, Halifax, England, is taking an active interest in the motor vehicle industry on that side. He is chairman of the Eclipse Brass & Copper Company, Ltd., the Central Engineering & Cycle Works, Ltd., and the Pioneering Finance Corporation, Ltd. The cycle works will be devoted largely to the production of motor vehicles, while the finance corporation was organized chiefly for the financing of motor vehicle enterprises on a large scale, and the exploiting of motor inventions. American inventors would do well to communicate with him.

The Kio Compounds.

Mechanics have long known the merits of plumbago as a lubricant, but up to the present time attempts to utilize it have been rendered futile by its habit of mysteriously disappearing from all bearing surfaces where it was placed. A "vehicle" or binding substance, to carry the plumbago to the proper place and keep it there, has been wanting. This "vehicle" the Kio Manufacturing Company, 99 Chambers Street, New York, claim to have discovered and to embody in their Kio compounds, which are varied according to requirements, thus adapting the pure plumbago to all kinds of fine lubrication.

Unlike oils, it does not run or stick, but spreads over the surface in a very thin film, which prevents the two bearing surfaces from coming in contact.

One of its chief points of superiority is its durability. R. C. Mudge, a well-known mechanical engineer of New York, states that in bicycle bearings he obtained an efficiency in wearing quality of 50 per cent. in favor of Kio Compound over all others, and a reduction in friction of over 25 per cent.

Large Motor Boat for Hartford.

William H. Watrous, president of the William Rogers Manufacturing Co., Hartford, Conn., has placed an order with Nilson & Bros., of Baltimore, Md., for a 78-foot launch propelled by two White & Middleton gas engines of 50 horse-power each. Gasolene will be the fuel employed, and the supply tank will hold sufficient to run the boat 1,000 miles. The engines, which are self-starting, will make 300 revolutions a minute at full speed. A supplementary four horse engine under the floor will furnish current for the electric lights with which the yacht will be equipped throughout. The boat will be guaranteed to make 17 miles an hour, and the builders hope to exceed the guarantee.

The work on "Gas, Gasolene and Oil Vapor Engines," by Gardner D. Hiscox, M. E., is now out, and will be furnished at $2.50, prepaid. The book has special reference to American engines of this class.

MINOR MENTION.

The Duryea Motor Wagon Company exhibited a carriage at the Rochester (N. Y.) bicycle show.

A receiver has been appointed for the Hirsch Motor Company, foot of East 138th Street, New York.

During the past week THE HORSELESS AGE has added to its list subscribers in Dublin, Ireland; Para, Brazil and Ngareng, Netherland, India.

The Hyatt Roller Bearing Co. are equipping calender rolls in several large paper mills with rollers carrying loads of from 5,000 to 15,000 pounds

The Electric Carriage & Wagon Company, 140 West Thirty-ninth Street, New York, have applied to the Board of Aldermen for a license to let their electric hansoms for hire within the city limits.

The American Motor Company, Havemeyer Building, New York City, have perfected a new sparking device, consisting of a spark coil, without a make-and-break contact inside the cylinder to get out of order.

C. H. Barrows, inventor of the vehicle of that name, which is illustrated in this number, leaves for England in a few days on business connected with the foreign rights under his patents. He will be absent about two months.

The C. H. Black Manufacturing Company, Indianapolis. Ind., announce that they are about to enter into the manufacture of motor vehicles propelled by a rotary gasolene motor, Four styles will be offered—a light pleasure carriage, a light delivery wagon, a two-seated carriage and a three or four-seated wagonette.

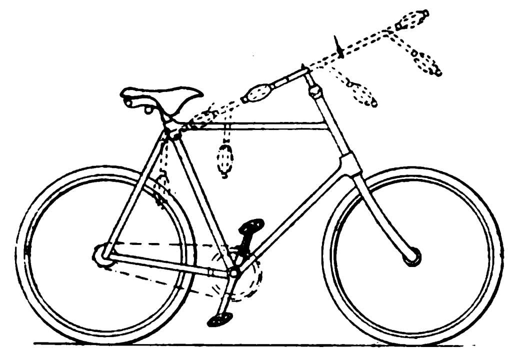
The Mills Gas Engine Company, Arbutus, Md., wish to say supplementary to the item on their marine motor which appeared in our last number, that it is to be a compound motor, having two direct-acting cylinders, one compound cylinder, and no stuffing boxes. They are also designing a five cylinder compound vehicle motor, having four direct acting cylinders, one compound cylinder, and no stuffing boxes.

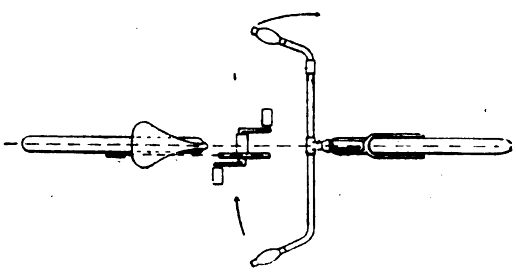
The Engineering Appliance Company, Jamestown, N. Y., are prepared to supply to motor-vehicle experimenters pneumatic-tired, ball-bearing "carts," especially constructed for the purpose. Any motor may be installed, and provision is made for tanks and other necessary accompaniments. The front wheels are pivoted at the hub, as is customary in motor carriages, and any desired finish may be had. We call attention to their advertisement in this issue.

S. J. Macfarren, manager of the Homestead & Highlands Electric Railway, Homestead, Pa., wishes to introduce electric launches and omnibuses as tributary to the road. The Monongahela River at this point is an attractive place for boating parties, and an electric launch whose batteries could be charged from the company's power-house would be in demand for this purpose on holidays, while numbers of persons who cross the river daily on business would be glad to avail themselves of its service. The batteries of the omnibuses could also be charged at the power station. Mr. Macfarren is looking for the proper parties to carry out both projects. He may be addressed care of THE HORSELESS AGE or direct.

Recent Motor and Gas Engine Patents.

576,439. *Velocipede or Motor Cycle.*—John E. Evered and Demosthenes G. Pappa, London, England. Filed July 27, 1896. Serial No. 600,688.





576,517. *Self-Propelling Vehicle.* — Robert W. Elston, Charlevoix, Mich. Filed May 25, 1895. Serial No. 550,671.

576,588. *Motor-Driven Harvester.*—Charley A. Kullberg' Hawick, Minn. Filed Feb. 1, 1896. Serial No. 577,659.

Claim.—In a harvester or similar machine the combination with the traction wheel or wheels, and the harvesting mechanism, of a motor mounted on the machine frame, and the independent variable drives extending from said motor, one to said traction wheels, and the other to said harvesting mechanism, each of said variable drives involving in the combination the loosely-mounted parallel counter shafts, the half clutches carried by said counter shaft, the loose sprocket wheels on said counter shafts provided with half clutches co-operating with said fixed half clutches, the chains connecting said sprocket wheels in pairs, the laterally movable shipper-bars with keepers engaging the hub of said sprocket wheels, the rock shafts and parallel arms connected to said shipper-bars, levers on said rock shafts, and a clutch for connecting one of said counter shafts with a rotary part of the engine, substantially as described.

576,604. *Gas Engine.*—Lewis H. Nash, South Norwalk, Conn., assignor to the National Meter Company, New York, N. Y. Original application filed May 22, 1890. Divided and this application filed Aug. 16, 1890.

576,633. *Vehicle Wheel.*—Calvin Toomey, Kansas City, Mo., assignor to C. Loomey & Co., same place. Filed Aug. 30, 1895. Serial No. 561,016.

576,933. *Electric Lighting for Vehicles.* — Jules A. Ageron, Paris, France. Filed Aug. 2, 1895. Serial No. 558,000. Patented in France May 18, 1895, serial, No. 247,500.

576,108. *Carburetor.*—Thomas N. Gibson, Argentine, Kan. Filed Feb. 24, 1896. Serial No. 580,612.

576,199. *Ball-Bearing Mechanism for Connecting Reciprocating into Rotary Motion.*—Charles M. Kimball, Toledo, O. Filed March 23, 1896. Serial No. 584,482.

576,252. *Journal Bearing.*—Curt B. Von Biedenfeld, Chicago, Ill., assignor to the Imperial Ball Bearing Axle Co., same place. Filed April 24, 1896. Serial No. 588,859.

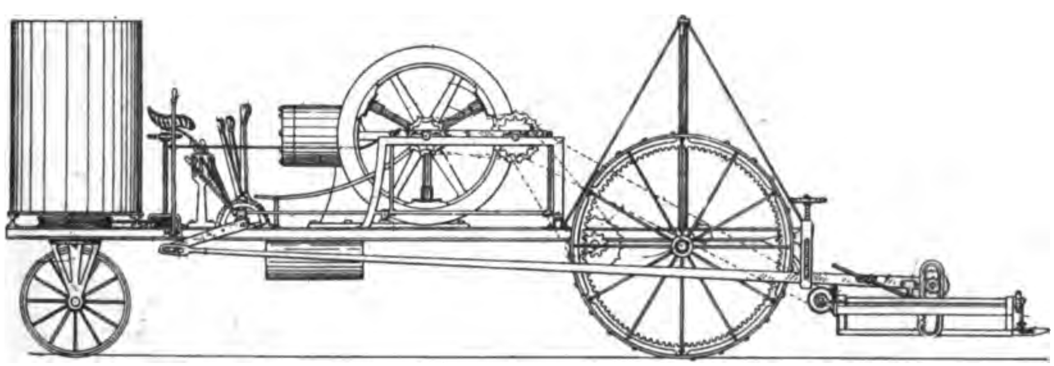
576,430. *Explosive Engine.*—Frank Burger, Fort Wayne, Ind., assignor of three-fourths to Henry M. Williams, same place. Filed March 23, 1895. Serial No. 542,976.

576,158. *Motor-Driven Velocipede.*—Ludwig Rüb. Augsburg, Germany. Filed May 8, 1896. Serial No. 590,784.

The improvements claimed are broadly as follows:

First: In consequence of the peculiar construction of the whole and of the details the benzin reservoir is made to replace the upper horizontal tube and the motor replaces the lower logitudinally running frame-tube, as met with in a bicycle or in a tandem bicycle. Therefore these two organs also form part of the framework of the machine, and thus avoid a complicated special framework as required in other motor cycles for holding the benzin reservoir, and of a motor. It is also very important that the crank-axle of the motor should be in the same place as the pedal crank axle in the usual bicycles.

Second: In place of the tube which supports the saddle and is used in other cycles, two rails are arranged which carry the back end of the benzin-reservoir with the saddle and between



MOTOR HARVESTER. C. A. KULLBERG.

which are fixed a magnetic inductor or other source of electrical force and a lubricator.

Third: The substantially horizontal position of the benzine reservoir and its construction afford good and uniform evaporation of the benzine, while in upright receivers the benzin-surface is too small, and after a little use it is too far back from the suction-opening. In consequence benzin-gas being heavier than the air, no gas but only air is sucked in, and no explosive mixture is carried to the cylinders.

Fourth: The motor possesses two pistons, lying one behind the other. The united cylinders, lying one behind the other, are formed at their upper and lower parts so that the whole replaces the oblique lower frame-tube of the usual cycle frame. By surrounding the whole length of the cylinders with a row of cross-lying ribs the motor is cooled during movement by means of the air, and a special water-cooling apparatus is rendered unnecessary.

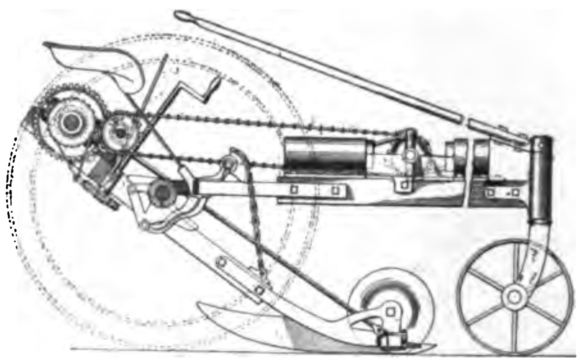
Fifth: The transmission of force from the motor to the back wheel is effected by toothed wheels in proportion about one to two, and a tube-shaft, which is put over one of two frame-tubes, which unite the crank-bearings with the axle-bearing of the back wheel. The hub of the back wheel is formed of a ring of about 20 millimetres thickness to replace or act as a fly-wheel. By this arrangement no chain is necessary, giving the machine a more pleasing exterior and an easier movement. The motor can work as fly, and thus avoid the shocks which damage the pneumatic tire of the back wheel, and are very disagreeable for the rider in machines where the connecting-rod is connected in consequence of the construction and the position of the motor directly with the back wheel.

Sixth: The bearing of the connecting-rod on the crank is a double-cone ball-bearing with two rows, which supports the great load on this place and allows of renewal after long use.

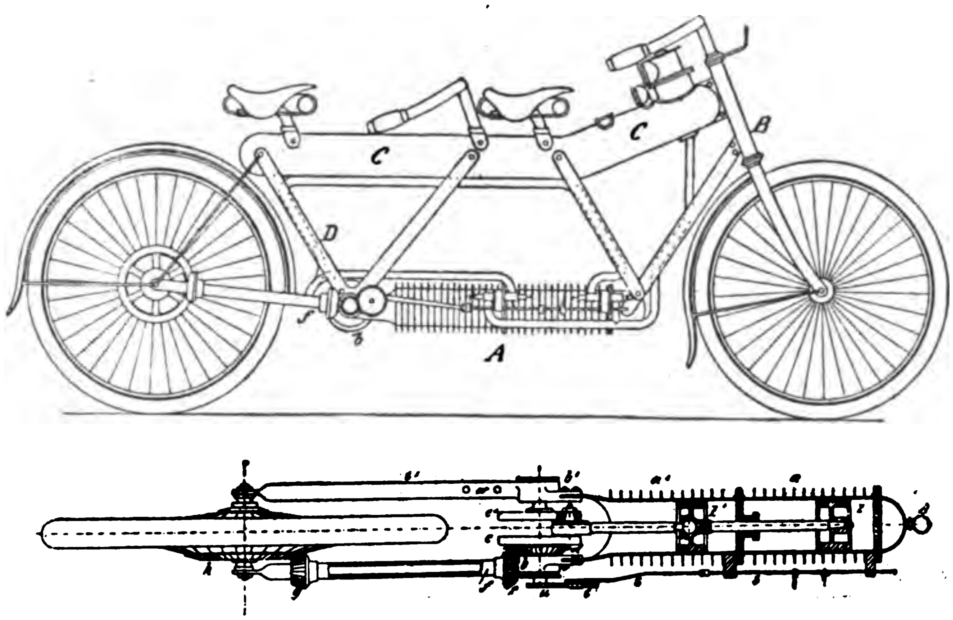
Seventh: The lighting of the gas mixture in the motor is performed electrically, and can only be effected in the cylinders, avoiding danger of explosion elsewhere and of fire. By this and in connection with the contacts arranged on the brake-level and operated by means of the latter it is possible for the cyclist to ride off at once without special preparations as are necessary in other lighting methods, and to stop also instantaneously.

577,105. *Motor for Harvesting Machinery.* George H. Ellis and John F. Steward, Chicago, Ill., assignors to the Deering Harvester Co., same place. Filed April 13, 1896. Serial No. 587,292.

Claim—The combination in a harvester of the supporting wheels, the main frame and the cutting apparatus, with a motor, a crank shaft and a clutch for disconnecting said crank shaft from said motor, the said crank shaft adapted to actuate the cutting apparatus and means whereby the machine is moved along the ground, said means consisting of two shafts having coincident axes, differential gearing mounted on the adjacent ends of said shafts and connected by gearing to said



crank shaft, the said shafts being adapted to transmit rotation to said carrying wheels, suitable brake mechanism upon the two said shafts and a hand shaft connected to both parts of the said brake mechanism whereby the rotation in one direction of said hand shaft serves to stop or delay one of said main

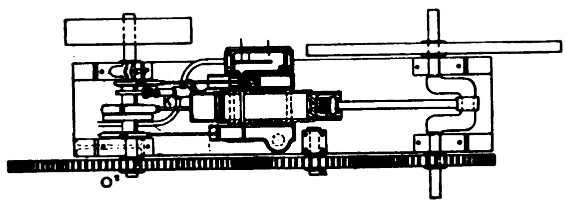


MOTOR CYCLE. LUDWIG RUB, AUGSBURG, GERMANY.

wheels, and by a rotation in the opposite direction serves to stop or delay the other said main wheel, without affecting the speed of the cutting apparatus, substantially as described.

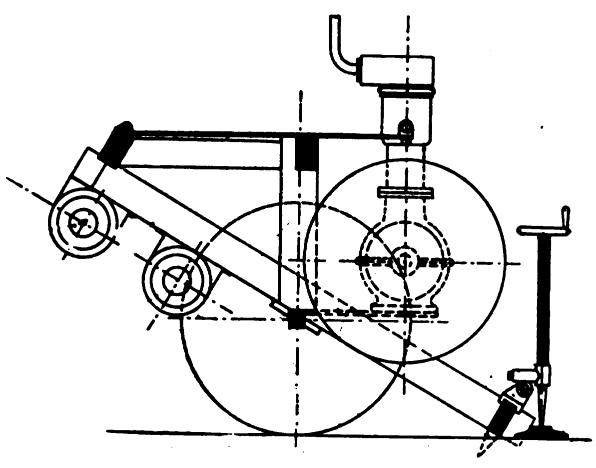
577,158. *Electric Igniter for Explosive Engines.* William F. Davis, Waterloo, Ia., assignor to the Davis Gasoline Engine Co., same place. Filed Sept. 24, 1896. Serial No. 606,875.

577,160. *Gas Motor.* William Donaldson, London, England. Filed Oct. 11, 1895. Serial No. 565,387. Patented in England April 4, 1895. No. 6,972



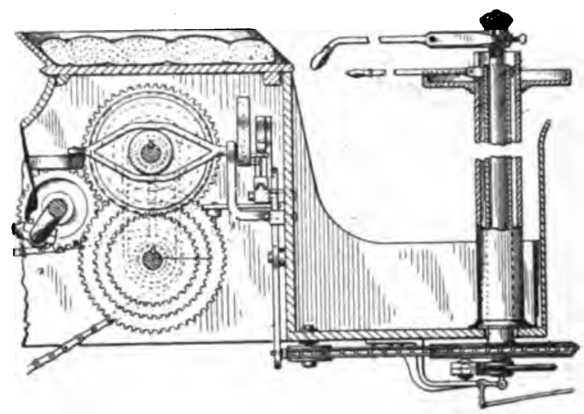
Claim— In an explosive gas motor, in combination, an open explosive gas cylinder, two revolving shafts, situated one at either end of said cylinder at right angles to and in the plane of the axis of said cylinder, bearings adapted to support said shafts on surface of bed plate, two single-acting pistons, one operative and one regulating in said cylinder, a crank and connecting-rod, connections between operative piston and main shaft; eccentric connections between the regulating piston and counter shaft, and gearing between said shafts adapted to revolve counter shaft at half the revolutions of main shaft to effect the variable regulation of the volume of burned products undischarged on exhaust and the ratios of compression and expansion.

577,167. *Portable Hydro-Carbon Engine.* William Maybach, Cannstadt, Germany. Filed July 11, 1896. Serial No. 598,850.



This invention relates to hydrocarbon engines for agricultural purposes. The first particularity of the construction resides in the carriage of the portable engine having one axle only, so that the whole possesses a low weight and may be easily moved. The second particularity resides in the engine or motor proper, being mounted in such a manner that when the frame is in a horizontal position the point of gravity of the whole arrangement lies about vertically over the axle, and if the frame is in an inclined position or the motor is in proper working position, respectively, the point of gravity is displaced in the direction to the front end of the frame to such an extent as to ensure the requisite stability of the whole.

577,185. *Road Vehicle.* Henry W. Clapp, Springfield, Mass. Filed Nov. 9, 1895. Serial No. 568,396.

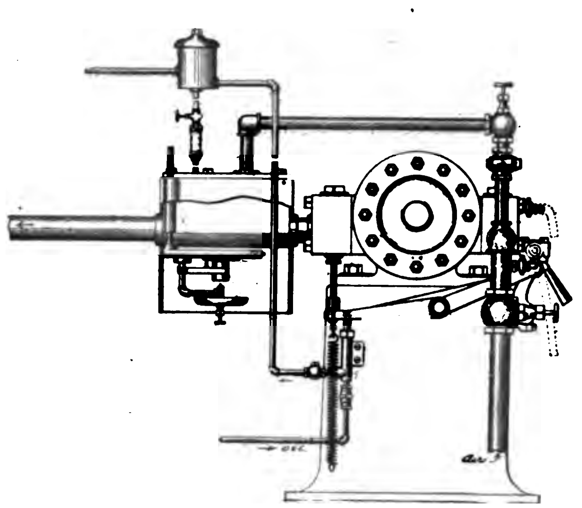


Claim.—In a road-vehicle, a non-rotatable forward axle, cylindrical axle-bearings pivoted on said axle, combined with wheels rotating on said bearings, a lever fixed to the inner end of each of said bearings extending therefrom toward each other, the segments, grooved blocks fixed on said axle under said segments and receiving in the grooves thereof the edges of said segments, presser-bars in said blocks for action against said segments, toggle-levers between the outer ends of said blocks, the hand-lever and connections between said hand-lever and toggle-levers for actuating the same, whereby said presser-blocks are moved, substantially as set forth.

Claim—In a road-vehicle, the shaft three, geared to the crank-shaft, shaft four, having several gears of differing diameters fixed thereon, combined with clutch devices freely hung on said shaft three, engaging said several gears, pivoted shipping-levers engaging said several clutch devices, a cam engaging one end of each of said shipping-levers, a shipper-bar having posts thereon engaging said cams, whereby reciprocally-rotating movements are imparted thereto, the pivoted shipper-lever engaging said bar, a drive-chain engaging said last-named lever, the vertical post having a sprocket-wheel thereon engaging said chain, and the hand-lever secured to said post, substantially as described.

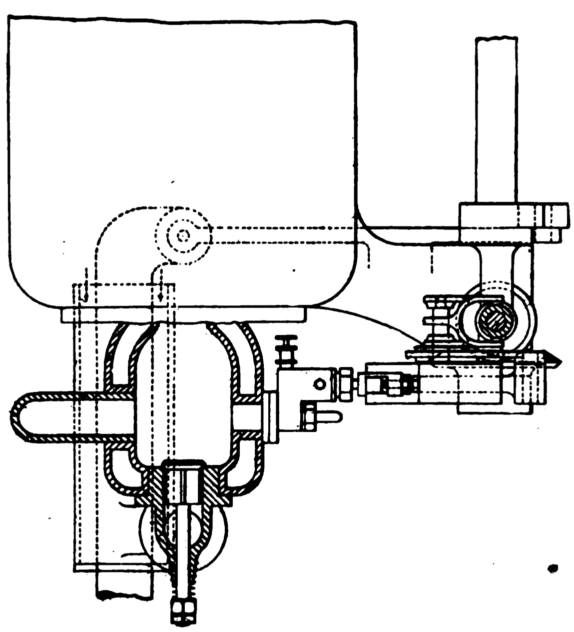
Claim—In a road vehicle the cams having one or more pins projecting from one side thereof, and a cam-groove on the opposite side, combined with the shipper-bar, having the posts for engagement with said pins, the clutch-shipping levers engaging in said cam-grooves, the clutch-discs, engaged by said shipping-levers, the gear-carrying clutch-cups, for engagement with said discs, the shaft having gears of varying diameters fixed thereon engaging with said gear-carrying clutch-cups, the shipper-operating lever, the tubular shaft, an operating-lever on said shaft, and connections between said shaft for imparting vibratory motions to said shipper-operating lever, substantially as set forth.

577,189. *Vapor Engine.* George W. Lewis, Chicago, Ill. Filed March 19, 1894. Serial No. 504,141.



Claim—In combination with a vapor engine, a vaporizer subject to the heat of the exhaust of the engine, an elevated reservoir for liquid hydrocarbon, a pipe leading from the reservoir to the interior of the vaporizer, a valve in said pipe adapted to allow the liquid to descend therefrom drop by drop into the vaporizer, a burner arranged externally to and in position to heat the vaporizer, and a pump operated by the engine for the supply of liquid to the reservoir.

575,812. *Explosive Engine.* Frederick C. Southwell, Grantham, England. Filed May 13, 1895. Serial No. 549,122.



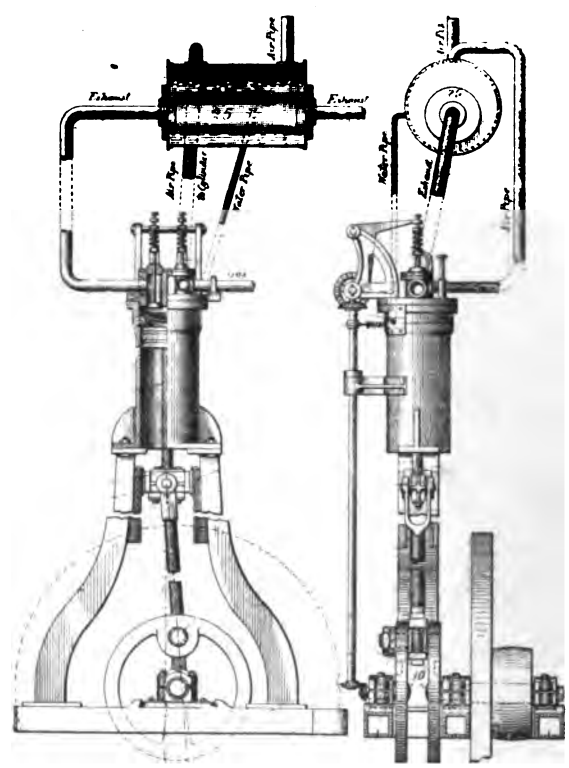
The inventor says:

"In most spontaneous combustion motors the heat attained by the vaporizer is such as to necessitate a moderately low compression, and therefore a low mean pressure. To obviate this, I employ a water-jacketed combustion-chamber, with or without a contracted neck, open to the cylinder, or, if desired, I may arrange that the air for the explosive mixtures should be drawn through the jacket. At a suitable angle to the combustion-chamber, preferably at right angles, on the one side I place a vaporizing tube or pocket, with or without a contracted neck, and on the other side, opposite to the said pocket, a nozzle through which the oil enters. I sometimes arrange in conjunction with this nozzle another nozzle through which air can be forced to inject the oil, thereby allowing an oil-pump to be dispensed with.

"In practice I make use of an air pump arranged in conjunction with the engine governor, the valve for controlling the admission of oil to the vaporizer being also arranged in conjunction with the governor, whereby I regulate the amount of oil admitted each cycle, at the same time regulating the air. In a suitable arrangement for carrying out this part of my invention I connect the air pump and oil valve to a lever common to both, and in connection with this lever I arrange an eccentric moved by the governor, which eccentric enables the governor to vary the position of the fulcrum of the said lever relatively with an operating cam. If desired, I can also regulate the supply of the oil and air by mechanism operated by hand in addition to the mechanism operated by the governor.

"To start the engine I heat the vaporizing tube with a lamp, which I may continue to use during working."

575,720. *Gas Engine.* Joseph Ledent, Baltimore, Md. Filed July 1, 1896. Serial No. 597,660.



The patent relates to a system of cooling the cylinder and piston of a gas engine, and the claim is as follows:

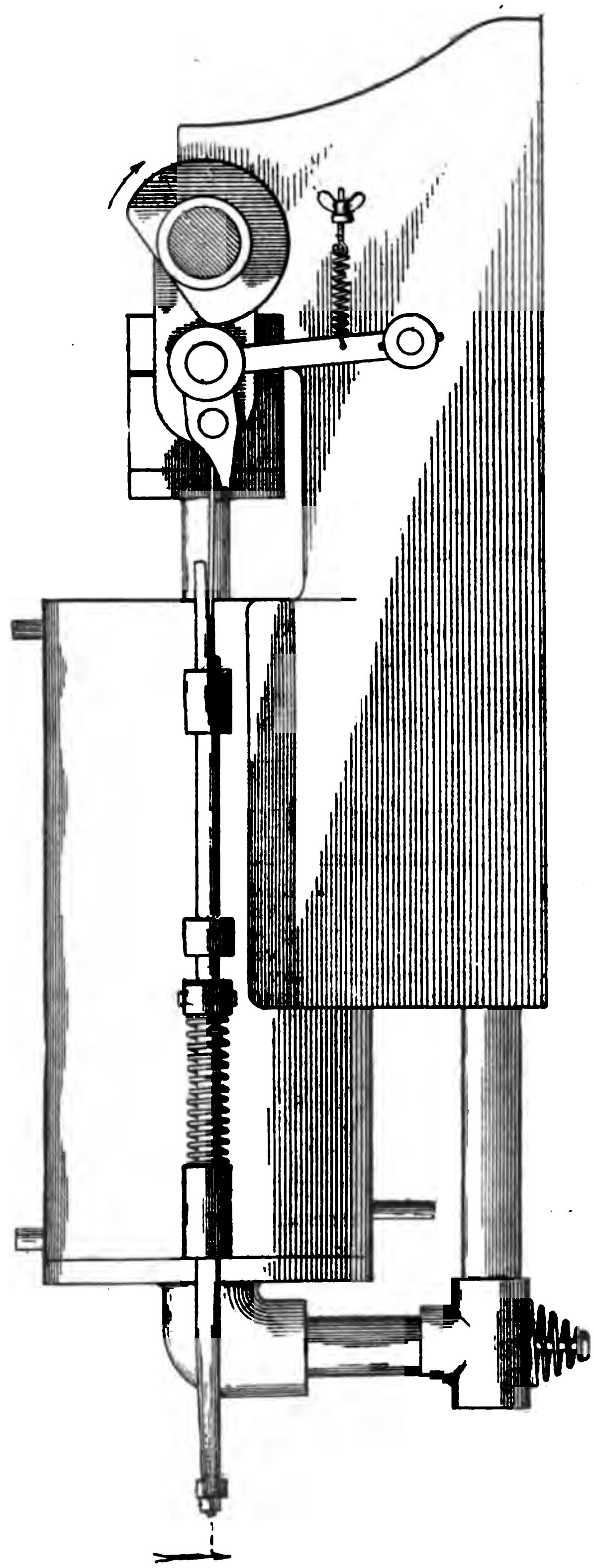
In a gas engine, the combination of a cylinder, provided with a water inlet near its upper end, a piston having an annular water chamber, a valve casing arranged proximate to the cylinder and communicating with said inlet, a hollow slide valve or similar mechanism working in said casing, a water supply communicating with the inlet of the casing, and means for throwing said valve into communication alternately

with the inlet into the cylinder from the casing and the water inlet from the source of supply to the casing.

The object of the invention is to provide an improved construction of gas engine in which the cylinder will be freed from all products of combustion after an ignition of a charge; to provide means for charging the cylinder with more or less combustible mixture without increasing or decreasing the pressure, so that the mixed air and gas in the cylinder is always under the same pressure; to provide means whereby the pressure in the reservoir is always the same, whether the engine is running idle or doing full work.

575,878. *Gas Engine.* Frederick W. Coen, Chicago, Ill. Filed May 14, 1896. Serial No, 591,465.

Claim.—In a gas-engine, the combination with the crank-shaft and the cylinder provided with an exhaust-port, of a valve at said exhaust-port, a reciprocatory bar connected with the said exhaust-port valve, a spring at the bar tending to hold the same normally in the position of opening said valve, a cam on the crank-shaft, governor mechanism actuated by the said cam to intermittingly engage and move said bar to close said valve, comprising a pivotal lever provided with the cam-engaging roller and a swinging rod-engaging finger, a spring pressing the lever at its roller against the cam, and tensioning means for the spring, the parts being constructed and arranged to operate substantially as and for the purpose set forth.



GAS ENGINE. F. W. COEN.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.

Price $3.00
Foreign 3.25

A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.

Price $1.00
Foreign countries 1.05

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Auto-Cars, Cars, Tramcars and Small Cars. By D. Farman. Translated from the French by L. Serraillier. Preface by Baron de L. de Nyevelt. 258 pages, 112 illustrations, 12mo., cloth.

Price $2.00

A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.

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Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.

Price $2.50
Foreign countries 2.75

IN PREPARATION.

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, MARCH, 1897. No. 5.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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Massachusetts Motor Vehicle Bill.

THE bill now before the Legislature of Massachusetts to license motor vehicles on the highways of that Commonwealth is a move in the right direction, and its passage will greatly encourage the new industry all along the line. The first draft of it, as published in this issue, is open to objection because of the needless restrictions which would make it a hindrance rather than a help to the new industry. In attempting to specify how many brakes and levers a motor vehicle should have in order to be permitted on the highway the law is getting into deep water and assuming a knowledge beyond that possessed by motor engineers of the present day. The conditions imposed put a premium on complication and would bar from the highway vehicles the simplest and most practical because they were not provided with a certain number of brakes and levers, whereas the main point of control might be as well or better obtained by fewer regulating devices than the law had contemplated. Simplicity is of supreme importance in all machinery, and in none more so than in the motor vehicle, where quick control is essential and the operator who has too many levers and brakes to attend to is at a disadvantage in critical moments when prompt action alone can avert accident.

Friends of the motor vehicle, who were given a hearing before the committee to whom the subject had been referred, succeeded in convincing them that the bill should be amended to read somewhat as follows: "Motor vehicles may be run on the streets or highways of this Commonwealth, provided they are so constructed as always to be under the control of the operator." This, of course, will not be the exact language of the act, but something of like import may be looked for as a result of the general deliberation. It stands to reason that neither the court, the Legislature, nor any living man can specify or is called upon to specify what means an inventor may adopt to attain the desired control of a vehicle, so long as the result is attained. The law does not dictate the style of harness a man shall use on his horse, if the animal is under the driver's control, and the lives and property of others are not endangered. This particular branch of applied mechanics is the province of the inventor and the harness manufacturer, while the province of the law is to lay down the general rules to which all who make use of the common roads must conform. A like freedom must be given the motor-vehicle inventor in the pursuit of this final object of control, or legislation will be discriminating against the new vehicle when its intention is to foster and encourage it.

The paragraph in the bill having reference to to the frightening of horses is certainly open to

criticism, for the converse of the proposition expressed therein leads us to the obvious absurdity that nothing which frightens horses is at present allowed on the highway, whereas deplorable runaway accidents are of common occurrence in our modern life. The horse is an uncertain and at times an unmanageable animal, taking fright most unexpectedly at sights and noises, which, in the daily work of the world he must unavoidably encounter. The owner of the horse is at law responsible for the animal when he brings him upon the highway, and, theoretically, is supposed to have him under control, although practically this is not the case, for a frightened horse frequently gets beyond the driver's control. Yet so indispensable has the horse become to our modern civilization that we have been compelled to accept him with all his faults and make the best of him. Consequently all that is expected of the user of the horse to-day is ordinary care and respect for the rights of others on the highway. If the horse runs away the driver is in as much or greater peril than his fellow citizen, horse or foot.

Bicycles, locomotives, wheelbarrows, brass bands and a hundred other things have frightened horses and brought death to many, but we do not, on that account, banish these things from the streets. They, like the horse, appear to be necessary to our civilization, and we must harmonize the discordant elements as well as we can.

In the introduction of a new vehicle upon the highway great care should be exercised, not because the new vehicle has not a right upon the highway, but because other vehicles have an equal right, and we are confronted with a condition and not a theory. The condition is the almost universal use of the horse; the theory is the motor vehicle, and forbearance and patience are virtures which, above all others, the pioneer must profess and practice.

Users of motor vehicles and manufacturers thereof will be forwarding their own interests if they exercise two-fold vigilance to avoid offending users of horses. By so doing they will smooth the way for the general introduction of the vehicle which cannot be frightened and cannot run away.

Acetylene for Motors.

Quite a number of experiments have been made in France, Italy and America to test the suitability of carbide of calcium or acetylene gas, its product, for motor fuel instead of gasolene or kerosene. On another page we quote a digest of an article on this subject, which recently appeared in a French journal devoted to gas lighting. In this article M. Ravel gives the results of some experiments in this line, from which he concludes that a special form of gas engine will be required to run successfully on acetylene gas. What that form of engine ought to be he does not suggest, nor is it likely to be ascertained without much further labor and expense on the part of many independent investigators.

One thing, at least, is determined, and that is that the explosive flame of acetylene registers extreme heat, and that the force of its explosion is terrific, owing to the large amount of latent heat stored in its elements. The chief obstacle in the way of its wider use at present is its high cost as compared with petroleum products. We are assured, however, by promoters of the new illuminant on this side of the Atlantic that steps are being taken to supply calcium carbide in quantities at a price which will gradually bring it within the reach of many industries where it seems likely to be useful.

As yet, American experimenters in the motor field have no data for publication regarding acetylene but in private interviews some of them express hopeful views of its future for this purpose.

Rotary Motors.

With admirable persistence inventors are still pursuing the elusive rotary motor. Hundreds of thousands of dollars have been expended during the past 25 years in fruitless efforts to solve this problem, which, alluring though it is, seems, from all known laws of mechanics, quite unsolvable. The lack of an abutment for the thrust and the impossibility of making a tight packing have relegated all the rotary motors so far tested to the garret or the toy room.

Early in the history of the motor movement in America rotary motor inventors sprang up like mushrooms, and with strong assertiveness presented their wonderful inventions, which, like the Old Man of the Sea towering up from the mouth of a little jar, were to develop gigantic horse-powers from ridiculously small compass. A year and a half has passed and not one of these inventors has demonstrated that his motor would propel even a baby carriage.

Gas, Gasolene and Oil Vapor Engines.

Under this title Gardner D. Hiscox, M. E., of New York, a life-long student of both the steam and the gas engine, has recently issued a book with special reference to American engines of this class.

The introductory chapters naturally deal with the theory of the explosive engine and the history of its development. The general subject of efficiency in gas engines next comes under review, and the two-cycle and four-cycle forms are compared. With respect to efficiency, we are informed that there is a possibility of 35 per cent. in the four-cycle, while the two-cycle engine rarely surpasses 20 per cent.

The causes of loss and inefficiency are then considered, leading up to the vital subject of fuels. Here the author gives some valuable data as to the proportions of gas and air that have been found to give the best results.

Carbureters, mufflers, governors, igniters and exploders come next in order, followed by chapters on lubrication, the general care of gas engines, testing and the measurement of power.

The foregoing chapters contain considerable information either not to be found in other works or expressed in more tangible form than elsewhere, but in the ensuing chapters it is seen that the author has encountered difficulties such as might have been expected in gathering adequate and up-to-date information about American gas and oil engines. The attention of the best talent has but recently been turned in this direction here. Much of the work really accomplished is still in abeyance or if on the market is so new as scarcely to come within the historian's range. About 40 engines of domestic manufacture are illustrated and described in the remaining chapters, including two which have come into prominence the past year or two through their use in motor vehicles.

A list of patents granted on gas and oil engines from 1875 to 1896 closes a volume which, while it may be disappointing to some in its references to American engines just at this most interesting period in the growth of a new industry, is nevertheless a work which every student of the hydro-carbon engine may study with profit.

Notes on Motor Vehicles for Roads.

THE following extracts taken from an article by W. Worby Beaumont, an English engineer who has given much study to the motor vehicle, are well worth reprinting for the sound sense which they display:

"It cannot be too often repeated that well-constructed motor carriages can be driven on good ordinary roads with very small power, and in a general way it is not until the carriages have to be lifted uphill that the demand for considerable power arises. A little consideration will show how much greater this power is than is usually supposed, and how much more advisable it is for many reasons that a moderate hill-climbing speed should be adopted.

"A few figures, by way of example, may be given. Taking a vehicle which when loaded weighs, say, 2½ tons, the power required on a good level road would be about 2.5 horse-power for a speed of eight miles an hour, or of about 3.75 horse-power for a speed of 12 miles an hour. To mount a hill, some parts of which may be on a gradient of 1 in 20, the 2.5 horse-power rises to 10.5 horse-power, but if a speed of three miles per hour were deemed sufficient for climbing the gradient of 1 in 20 only about four horse-power would be required. Now, for dealing with bad roads these quantities ought to be doubled, so that to take 2½ tons of vehicle and load up a gradient of 1 in 20, at the rate of eight miles, would require about 20 horse-power, whereas if a reasonable speed for the hill climbing were adopted only about eight horse-power would be wanted. This, of course, means that some form of speed-reducing gear for hills must be employed, but this may be of a simple kind, and it would secure lessened first cost of motor, lessened cost of working, smaller weight, better arrangement, and more room for the machinery, and if a steam motor be employed a lessened weight of boiler and of condenser, and practical possibility of producing a vehicle of moderate weight, instead of the prohibitive weight which high speed hill climbing means."

Mr. Beaumont then proceeds to make a comparison between steam and oil vehicle motors, a comparison much fairer and thorough than the one which the editor of the London *Engineer* recently made:

"With the steam engine we have greater range and ease of manipulation, within the limits of no power and full power, than with any other motor;

for short periods it may be made to give more than its proper maximum, it may be stopped and started with more freedom, certainty and smoothness than any other motor, with the exeeption of the electrical; it may be employed for traveling any distances with fuel available everywhere, is easily fitted with reversing gear, and is easily understood.

"Now, for long-distance work the only competitor at present with this is the oil or spirit motor, the disadvantages of which are small range of power within the maximum, no excess of power for short periods, difficulty of starting, and consequent necessity for keeping the engine running when the carriage is stopped for short periods; vibration due to explosive impulse on the piston, and necessity for running the motor at nearly full speed before starting the vehicle, most of the change of speed having to be made by frictional or other gearing. The motor and vehicle cannot be started together, and hence whenever the vehicle is started the motor is called upon to attempt to impart to it a speed equal to that proper to the lowest ratio of the speed gear. A frictional gear means loss of power and loss of time in overcoming the inertia of the vehicle, and unless the frictional clutch is connected to the motor through very low speed positive gear, the starting is almost certain to be effected more or less jerkily. To avoid the difficulties attending the use of all variable speed gears in which the gear not in use is running whether at work or not, the author devised the "antinertia" power gear and clutch, by means of which any driven thing may be put into motion by positive gear at a low speed, and in which the gear for the time being doing the work is the only part in motion.

"Having described the disadvantages of the oil or spirit motor, it is necessary to describe their merits as compared with the steam engine. The first is that the oil engine requires no steam generator and no condenser. It uses fuel of a high calorific value, easily carried, and no trouble to apply, and it uses it more economically than the same fuel, oil, can be used for the generation of steam. As it needs no apparatus for the generation of the working fluid there is no such apparatus to attend to and no space required for it. Hence the motor and gear can be much more conveniently arranged than the steam engine. This it is that gives it all its advantages over the steam engine, even assuming all the little troubles connected with boilers and condensers to be entirely overcome. The motor will, however, weigh a little more than the steam motor of equal power, running at equal speed, and this may, perhaps, be put at 25 per cent. The weight, moreover, of a boiler and condenser is not all in excess of the oil motor, for jacket water arrangements and exhaust silencer have to be included. The oil motor cannot however, use the cheapest fuel, such as coal or coke, or even crude or the partly refined petroleums, and this is an objection to it for the larger powers and for vans and vehicles, which must in any case have a paid driver and attendant to whom the work of stoking would be part of his duty. It is, moreover, an objection to oil engines for such purposes that they in some respects depend upon more delicate adjustment as to air, vapor, and oil supply, admission and ignition, and it is not always that even those well acquainted with oil engines can say precisely and at once why an oil motor will not start, or being started will not continue to work. The cause may be one of a dozen things which are not obvious, and which may take a good many minutes to find out. In a corresponding sense the steam engine is not at all delicate, and this is an advantage it will probably offer for a considerable time, but with decreasing force, as the motors become more definite or fixed in points which are now subject to adjustment and are more generally understood. In the oil motor, either the main or the supplementary air supplies may be too much or too little, the oil supply may be too much or too little, or may stop, the exhaust or the air valve may either of them leak, or be made temporarily to leak, by dirt under the seat, or part of it, or by corrosion or erosion, and in any of these cases it is difficult to say what is happening. The ignition tube may not be hot enough; this may be seen, or it may be stopped, or partly so, which cannot be seen, and this must be guessed, or like any of the other numerous things, must be diagnosed. To sum the matter up, it may be said that the steam engine would be in every way the best were it not for its boiler and condenser or escaping steam; and that the oil motor is best where the boiler and condenser are both inadmissible, and where the vibration it causes, and its occasional freaks which are diminishing in frequency, are not sufficient reasons for rejecting the advantages of motor carriages."

Motor Boats on the Increase.

BUILDERS of motor boats and marine motors report an extraordinary demand for their product this Spring, the demand including all sizes, from the smallest hunting boat or yacht tender up to

cruising yachts with the most luxurious equipment. The pleasures and healthful benefits of recreation upon the water are coming more and more to be appreciated, while for business purposes the motor boat is finding a rapidly widening field of usefulness. As between the sail and the motor in pleasure craft persons of mature years and liberal means generally prefer the latter because of the increased comfort and safety, and the economy of time secured through this method of propulsion. Even those who from long habit are wedded to the sail boat are compromising the matter by putting in auxiliary power to help the fickle winds. Hence the unpredecented demand from all sides, which is now crowding manufacturers and will compel them to increase facilities before another season.

Of the various motive powers now offered for the propulsion of boats the gas engine seems to have the preference for small boats and launches. Steam still has the call, apparently, for large cruising yachts, but from present indications it is only a matter of time when this field also will be invaded by the gas engine.

Motor Cabs in New York.

THE metropolitan newspapers have had a great deal to say lately about the electric hansoms which the Electric Carriage & Wagon Company are now plying for hire in New York City. About a dozen of these cabs are at present in regular service, no difficulty having been experienced in procuring the necessary license from the Board of Aldermen. Many of the chappies and men-about-town are availing themselves of the opportunity to try the sensations of riding in a horseless vehicle, which sensations they are describing privately in the clubs and publicly in the columns of the press. Even aristocracy has been bold enough to overcome convention and step into the horseless cab. A scion of one of the wealthiest families took his bride to ride in one of them the other day as an incidental diversion of their honeymoon, thereby establishing a precedent which will encourage others of high station to make use of the new vehicle for trips matrimonial or otherwise. Some of the views expressed are decidedly narrow and prejudiced, as is universally true when any new idea is presented for public approval, but that the judgment of the people is in the main favorable, is proved by the statement of the company that the cabs are in almost constant demand and that more will be put in service soon. For the enterprise they have shown in being the first to introduce motor cabs in the streets of New York this company is entitled to great credit and will no doubt reap commensurate profit.

Acetylene as a Motive Agent.

When calcium carbide first made its appearance as an industrial product, one of the uses suggested for it by some of its over-enthusiastic advertisers was as a source of power for motors. There has now been time to examine the possibilities of calcium carbide in this direction, and the *Journal de l'Eclairage au Gas* of 1896, pages 266 to 2 8, contains the accounts of some experiments by M. Ravel that are of great interest in this connection. As regards the explosive properties of mixtures of acetylene and air, the range is found to be from 4.7 per cent. up to 57 per cent. by volume of acetylene; while the maximum force is developed with a volume percentage of acetylene of 7.8. This is a wider range of explosive properties than is found in mixtures of coal gas and air. The maximum rate at which the flame travels through the mixture of acetylene and air is also much in excess of that found in the case of coal gas and this gives to the explosions a detonating character. The ignition temperature of acetylene is 480 degrees C.; that of coal gas is 600 degrees C. The temperature of combustion of a 50 per cent. mixture of acetylene and oxygen is 4,000 degrees C., 1,000 degrees C. higher than that of the oxyhydrogen flame. It is interesting to compare with this temperature that obtained by Moissan in his electric furnace investigations. By using a current of 2,000 amperes at 80 volts, Moissan succeeded in obtaining a temperature of 3,500 degrees C., and in volatizing carbon. A temperature of 500 degrees C. beyond that obtained in the electric furnace, therefore seems to indicate great possibilities for acetylene as a sort of heat in high temperature research.

On account of the detonating character of the explosions of mixtures of acetylene and air, it is unsafe to use a higher volume percentage of acetylene than 4 in. gas-engine experiments. M. Ravel lays stress upon the necessity for attention to the four points already noted when working with acetylene. Summarized these are:

a. Rapidity of flame propagation in explosive mixtures.
b. Low ignition temperature.
c. High combustion temperature.
d. High explosive force.

The experiments to decide its applicability to motor purposes were carried out in a double-acting two-hp gas engine. Comparative experiments with coal gas were made with the same engine. The best results were obtained with a consumption of 28.4 cubic feet of acetylene per hour, with an indicated horse-power of 2.48; 85.3 cubic feet of coal gas per hour were requisite to obtain the same result. The ratio of the calories of heat generated by combustion in the calorimeter for acetylene and coal gas is about 2.5:1.

As a result of his experiments, M. Ravel comes to the conclusion that some special form of gas engine will be requisite in order to obtain safe working when acetylene is used.

Coming to the question of comparative expense, it is necessary to remark that the present sale price of calcium carbide, which varies from £16 to £28 per ton, is much in excess of its cost price. The latter, under the most favorable manufacturing conditions, is believed to be £6 per ton. Coal-gas is sold at a price much in excess of its real cost of production; and where it is manufactured for use on the spot, it is safe to take its cost as 10d. per 1,000 cubic feet, in place of 3s. Using these prices as a basis of comparison we obtain the following figures for the cost of one indicated hp-hour, when using acetylene and coal gas.

The calcium carbide is estimated to yield five cubic feet of acetylene per pound. The costs of 1,000 cubic feet of acetylene, at the two prices £10 and £6 per ton for the carbide, are therefore 17s. 9d. and 10s. 8d. respectively.

	Cubic Feet Used per Indicated Horse-Power Hour.	Cost.	
		Per 1,000 Cubic Feet.	Per Indicated Horse-power Hr.
		s. d.	d.
Coal gas	34·4	3 0	1 24
		0 10	34
Acetylene	11.4	17 9	2 42
		10 8	1 45

Taking the higher estimates, we find that acetylene is nearly twice as costly as coal gas per indicated hp-hour when used in the present form of gas engine, and that if the "cost" prices of calcium carbide and coal gas be considered the ratio rises to over 4 to 1.

Its use for motor purposes is consequently likely to be a very restricted one, and coal gas and oil would seem to be in little danger of misplacement, the more so as the Home Secretary has scheduled calcium carbide as an explosive, which means that it can only be stored and conveyed under special conditions, which are onerous. The fire insurance companies also forbid its use in buildings under their policies.

The manufacture of calcium carbide goes steadily forward although its practical applications seem to be still in the experimental stage of development. Acetylene has been successfully tried on one of the French railways for lighting the carriages; but we have yet to learn that it has been permanently adopted for lighting purposes on any railway in this or other countries. There are estimated to be now 17 manufactories of calcium carbide in Europe and America. The majority of these are merely small experimental works, but some few of them are large undertakings; as, for example, the Pictet Company in Brussels, with a capital of £80,000.

The famous Neuhausen Aluminium Company is arranging to commence the manufacture at Rheinfelden, near Bâle. Another works for the same manufacture is being erected at the same spot by a German firm.

There is consequently likely to be fierce competition between the various producers of calcium carbide in the near future, and a fall in price similar to that witnessed in the aluminum industry in the years 1890–4 will most probably occur. Competition between the rival producers of aluminum caused a fall of 75 per cent. in price during the years named, and only two surviving companies remained at the end of this period of industrial competition If such a fall is to occur in the calcium carbide industry, those companies laboring under excessive capital charges, or with heavy royalty charges to pay, will fare badly in the fight —*Engineering*.

MINOR MENTION.

The Knickerbocker Engine Works, Hartford, Conn., are adapting their engines to compressed air.

The Vim Cycle Company, 331 Wabash avenue, Chicago, Ill., are manufacturing a small motor carrier for the United States mail service.

The Winton Motor Carriage Company is being organized at Cleveland, O., with a capital stock of $200,000 to manufacture the Winton motor carriage.

A subscriber wishes to know of a reliable friction clutch of 8 horse-power, at 100 revolutions per minute, that can be operated in a space of five inches on the shaft.

Mohler & De Gress, importers of bicycles and machinery, Mexico City, Mex., are building a motor carriage, which they expect to have in operation before the Summer.

Steps are being taken in Boston, Mass., to start a company for the purpose of placing on the market a steam wagon, built in the shop of George E. Whitney, of East Boston.

The American Electric Vehicle Company, of Chicago, Ill., are constructing a large factory at New Chicago, Ind., where they will be enabled to turn out their product complete and in large quantity.

R. F. Stewart, Pocantico Hills, N. Y., has redesigned his automatic clutch. In its present form it is much lighter, quicker to act, more positive, and takes less room between the spring and the hub of the vehicle.

The biograph, the new instrument which photographs life, or objects in motion, was recently focused on the famous self-propelling fire engine, owned by the city of Hartford, Conn., and some remarkably fine views of the ponderous machine in action were obtained.

James B. Bray, Waverly, N. Y., who writes that it is 18 years since he was able to walk, is building a small motor carriage for his own use. It will be propelled by two gasolene motors, 3½ x 3⅝ inch cylinders, and will weigh about 550 pounds. The seats, for two persons, will be arranged tandem.

The American Motor Company, Havemeyer Building, New York, are running their factory night and day, lighting the premises at night by 33 electric lights delivered from one of their kerosene motors at an expense of 2½ cents an hour, computation being made on a retail price basis. Among their recent orders is one from the Canadian Government for a 25-hp upright gas engine. The yacht tender furnished with a 1½-hp phosphor bronze American motor, which is now to be seen in the window of their office, fronting directly on the Cortlandt Street Elevated Railroad station, is one of the most conspicuous advertisements in the city. A new catalogue will soon be issued by this company.

Charles E. Ellis, of Philadelphia, Pa., has imported a Bolleé tricycle, such as has been already described in The Horseless Age.

Bill to License Motor Vehicles on the Highways of Massachusetts.

A bill is now before the legislature of Massachusetts to license the use of motor vehicles on the highways of that commonwealth. As originally introduced early in the session the bill read as follows:

An Act to Permit of the Running of Motor Vehicles in this Commonwealth.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

Section 1. Motor vehicles may be run on the streets or highways of this Commonwealth. Said vehicles being made safe by being so constructed as,

First: To be under the full control of the operator or driver at all times by means of sufficient levers to throw said vehicle out of power at will:

Second: Which is supplied with steering apparatus so efficient as to make it easy for the driver to keep the safe line over rough roads by being supplied with competent levers and stays for this purpose, so that obstructions in the highway may not throw the vehicle dangerously out of its course;

Third: Which is also furnished and equipped with two distinct separate brakes with two or more modes of operating said brakes;

Fourth: Which is provided and equipped with a suitable stay, safeguard device which shall be sufficient to hold all the levers which release the power from the wheels of the vehicle, and also those levers which apply the several brakes in place when applied for the purpose of leaving the vehicle, so that an unauthorized application of the motive power cannot cause the vehicle to run where it might be dangerous;

Fifth: And which is so constructed and its novelties so covered and hid as not to be liable to frighten horses on the highway by its novel appearance.

Section 2. That only such motor vehicles as answer to the above requirements shall be permitted to run on the highways of this Commonwealth.

Section 3. That it shall be the duty of the State police to see that the provisions of this act are complied with.

Section 4. This act shall take effect upon its passage.

On April 13 and 14 a hearing by the Committee on Roads and Bridges, to whom the bill had been referred by the House, at which a great deal of interest was manifested by the lawmakers and much valuable testimony offered in support of the measure, which it is proposed to simplify so as to relieve the new vehicle from unnecessary restriction. All that is desired by the authors of the bill is that some sanction be given the use of motors on streets, in order that people who wish to run them may feel safe from any annoyance from lawsuits on account of frightened horses.

George Henry Hewitt, president of the Duryea Motor Wagon Company, Springfield, Mass., stated before the committee that his company received a great many letters which showed that people who would otherwise use the carriages are now holding back because they want to see what would be the result of a possible suit on account of damage or accident from the use of the motor vehicles in the streets. Even if the present law permitted the running of the vehicles, he said, some legislative sanction of their use would relieve this uncertainty and allow the speedy development and perfection of the motor carriage.

Several representatives of leading merchants testified to the undoubted economy of the motor delivery over the horse delivery now in use. Mr. Quimby, superintendent of Houghtan & Dutton's delivery system, stated that his firm was anxious to use motor wagons in delivering its goods, because a motor could be run all day for less than a cent a mile, whereas, he said, it cost 20 cents a mile to run a two-horse wagon, and the horses had to be changed at least once.

George B. Upham, an attorney, representing the manufacturers of the Whitney full automatic steam wagon, said it was not unusual to meet half a dozen motor carriages during a short stroll in Paris. The Bon Marche, the large department store of that city, delivered its goods with these carriages, on account of the economy of that method over horses. This came chiefly in relieving the firm from keeping a large number of horses during the dull season in order to be ready to handle the heavy business of the "rush" season. On a bicycle tour through France he had met a number of parties making "land cruises" through the country by means of motor carriages. He thought a like increase in the use of such carriages in this country would result as soon as freedom from annoyance by legal objections could be secured for those who wish to use them. He mentioned the public gain, through their use, on account of the decreased wear on the streets and roads and the increased cleanliness from the absence of horses.

A Duryea gasolene wagon and a Whitney steam wagon were brought up to the State House during the hearing, and the Governor of the State, the Mayor of Boston, and the members of the committee were invited to ride and judge of the advantages of the new vehicle for themselves. They were not slow in accepting the invitation, and were so well pleased with the vehicle that it can be said, with some positiveness, that the bill in its amended form will go through.

The Elston "Balance Gear."

An improved differential or "balance" gear for motor vehicles has recently been invented by Robert W. Elston, a retired carriage builder of Charleroix, Mich.

A continuous main driving shaft, rotated by any source of power, has bearings fixed to it so that they turn with it, not relatively to it, and carry an auxiliary shaft which is rotatable in them and to which driven wheels are geared reversely, in order that if either one of them should at any time rotate relatively to the main or driving shaft, it will effect through the auxiliary shaft a reverse rotary movement of the other driven-wheel. Although the parts are arranged as described to produce the reverse rotation of the road-wheels when such is necessary, it is to be understood that they are so disposed as normally to turn in company with the main or driving shaft and both the driven-wheels in the same manner as if the shaft and driven-wheels were fixed together.

In Fig. 1 *A* is the main or driving shaft, which, unlike driving shafts hitherto usually employed with balance gears is continuous, whereby lightness and strength are said to be secured; to this

shaft is keyed a spur-wheel A^1 by which rotation is imparted to the shaft A by a motor, a pedal crank-shaft or otherwise. At the opposite ends of the shaft A are sleeves B B^1, which are rotatable relative to the shaft under certain conditions, as hereinafter explained, and in effect constitute the hubs of the road or driven wheels, the latter being fixed upon reduced portions B^2 of the sleeves. However, these sleeves are merely typical and represent the hubs of the road wheels or any other part which is to be driven by the gear. The sleeves B B^1 are prevented by any convenient means from moving outward along the shaft A away from each other, and shoulders on the shaft A prevent any inward movement of the sleeves.

Upon each of the sleeves is formed a disc with a flange, and in the circular cavity of each disc within a flange is fixed an internally toothed ring B^7.

D D^1 are bearings for the shaft E, preferably in the form of discs, so as to serve as covers or lids to close in the internally toothed rings B^7; like the wheel A^1 they are fixed to the shaft A to which the auxiliary shaft E lies parallel. E^1 E^2 are spur pinions fixed on the opposite ends of the auxiliary shaft E; the pinion E^1 gears with the internally toothed ring B^7 of the sleeve B through an intermediate pinion F carried rotably upon a stud F of the disc D, whereas the pinion E^2 at the opposite end of the shaft E is geared without the intervention of an intermediate pinion, directly with the internally toothed ring B^7 of the other sleeve B^1. It will be seen that if this arrangement of gearing B^7 F E^1 E^2 B^7, be set in operation the rotary motion of one toothed ring B^7 will be the reverse of that of the companion ring by reason of the employment of the intermediate pinion F^1.

Normally when the main or driving-shaft A is rotated it will carry round with it the discs D D^1, the shaft E, and the sleeves B B with the driven-wheels attached to them, just as if all these parts were integral with the main-shaft A; but if either of the driven-wheels with its sleeve B or B^1 be retarded (as would happen if the vehicle were steered out of a straight course so as to travel in a curved path in which it would be necessary for the wheel nearer the centre of the curve to have smaller speed of rotation about its own axis than the driven-wheel at the outer side of the curve) the toothed ring B^7 of the retarded wheel by reason of the maintenance of the movement of the main or driving-shaft by the motor apparatus would serve as a rack upon which one or the other of the pinions E^2 or F would roll, thereby producing rotation of the auxiliary shaft E in its bearings to effect a reverse rotation of the other sleeve and its driven-wheel about the main or driving-shaft. Mr. Elston has taken out patents on his device in this country and in England.

Fig 1

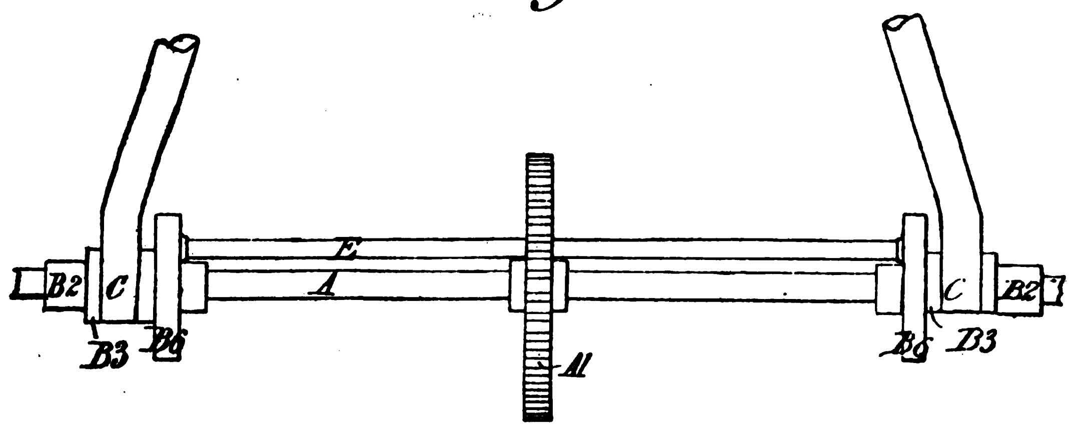


Fig. 3.

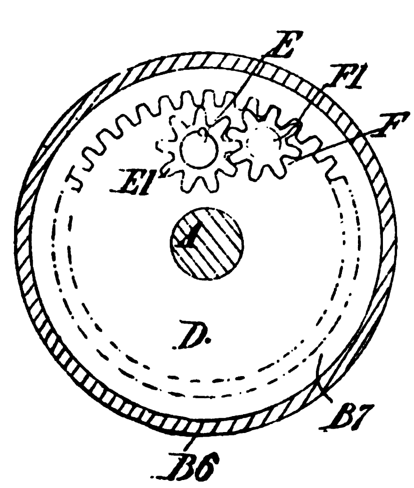
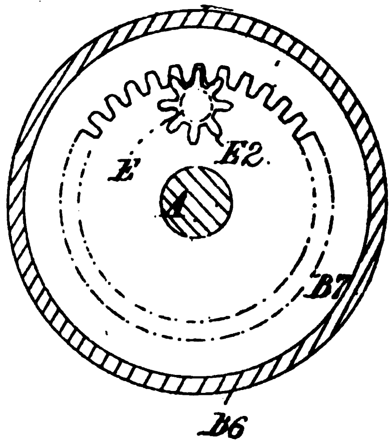


Fig 4



Trussed Agricultural Tractor.

Millions of dollars have been spent in Europe and America in experiments to secure a power capable of pulling heavily on soft ground. Nearly all efforts have been made along the line of wheels, yet it ought to be manifest to a thinking mind that traction or grip can be secured only by weight and that if weight is not distributed, but put upon a wheel of ordinary size, it must sink into soft ground.

It would require a vivid imagination to compass the revolutionary effect on agricultural and land values when the wide gap between the stationary engine and the railroad locomotive is practically filled. Excavation, railroad construction and general haulage must alike be affected. An effort or two was made to distribute weight about 20 years ago, but the machines could not surmount an obstruction four inches high, and were therefore impracticable.

Among present American inventors perhaps none has given more time and study to this particular branch of the motor problem than G H. Edwards, mechanical engineer, 519 Carroll Avenue, Chicago, Ill., whose "Trussed Tractor" we illustrate here.

The object of the invention is to utilize steam power in plowing, seeding, harvesting, ditching, threshing, hauling, railroad construction, derrick work in bridge building, and to perform all such operations on such a large scale that they will be exceedingly economical. Plowing, seeding and harrowing are intended to be done at one movement and at about one-tenth the cost of the same work by means at present employed.

The first tractor built on the folding truss plan weighed fourteen tons, and although a very crude affair, is said to have demonstrated in the field the basic principle used for distributing weight. The second machine weighed twenty-four tons, and proved itself capable of running over very soft ground and of pulling heavily.

After a close study of proportions, and the more accurate calculation of the strength of materials, the inventor concluded to build a machine entirely of steel and iron, which would weigh but ten tons and do the actual work, in the field, of fifty horses. To accomplish this purpose an expert draughtsman was employed to aid in first putting the machine on paper. One year was spent in this work alone, and the cuts herein shown represent some of the work done.

In traveling over a field the condition of the soil practically necessitates not only the use of an endless belt for the wheels to roll upon, but also the employment of means for so trussing or bracing such portions of the endless track as may be between the front and rear wheels as to cause the weight to be distrubuted throughout said portion of the track and thus provide a large area of surface arranged to bear upon the ground and sustain the weight throughout its entire area.

A valuable feature of this machine is that it can be adjusted in a few moments by tightening or loosening the nuts on the bolts which give the belts its rigidity in upward pressure, so that either a perfectly flat surface, or the segment of any sized wheel desired, may be presented to the ground. It will be seen that the belt is so cambered as to *represent* the segment of a wheel 30 feet high, which is probably flat enough to carry 10 tons over an ordinary soft or plowed field. When the web or belt is thus cambered, the machine is turned completely around in 65 feet, but when the belt is perfectly flat it requires a little more room to turn it about.

Any ordinary field presents many obstructions to the advancement of the machine, such as furrows, ridges and general unevenness of surface; and hence, without some co-operative means for permitting the machine to be driven over such obstructions by reasonable application of power, it will be practically useless.

In order to overcome such obstructions, the avoidance of slip on the part of the wheels is as necessary as the employment of a truss for bracing the track, and in this connection the provision of means for accommodating the trussed track to the obstruction over which it must pass so as to avoid loss of power, and relieve the steering wheels from unnecessary weight while the traction device is climbing over the obstruction, is just as necessary as trussing or preventing slip as aforesaid.

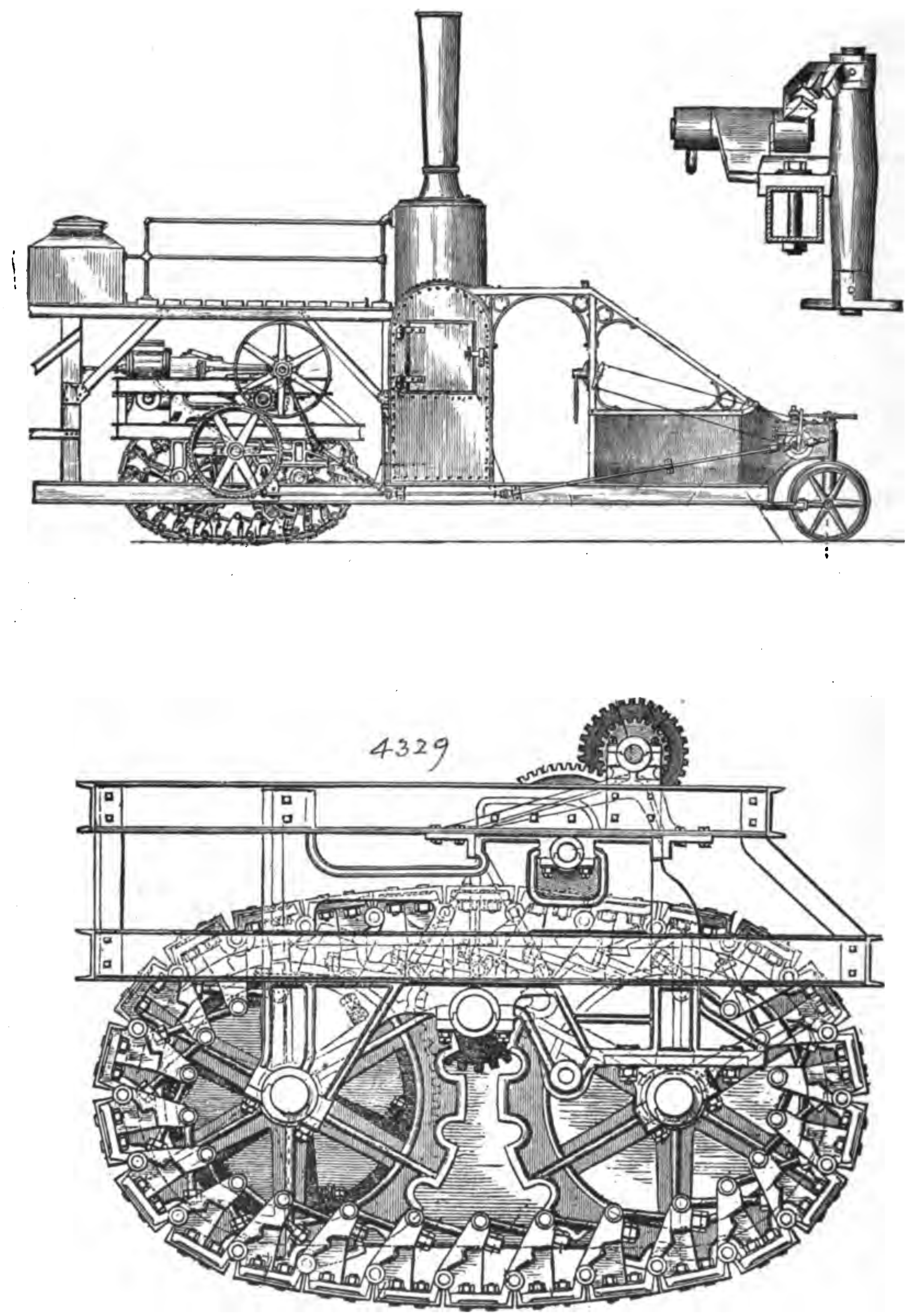
To attain this the machine has been provided with an endless trussed belt, which is geared, and connected with and driven from the main supporting wheels, and a jointed frame adapted to provide both a rocking truck, which travels upon the endless trussed track, and a frame portion which is hinged to and in part supported from the rocking truck, by which arrangement the lower leaf of the track, which will at times be rigid as against upward pressure, may by the rocking action of the truck adapt itself to the inclination of the ridge or furrow over which it must pass. Thus the truck will adapt itself to the inequalities of the ground, and the steering wheels of the frame to which the track is hinged will be relieved of extra weight, while at the same time the full power of the traction is used as a propelling agent. The water tank could, of course, be arranged upon the main frame, but in order to permit the trussed track to carry the weight to the best advantage, and also to dispose of this bulk in an exceedingly convenient way, it is placed within the space bounded by the endless track.

Mr. Edwards states that a 50-hp machine will plow four to five acres an hour, and in 16 hours do the work of 100 horses, at a cost less than one sixth that of horses. A man and a boy can handle it on any kind of land, even when water runs in the furrows, the cost per day being $3 for labor, $6 for coal, and three or four times as much for the 3,000 pounds of water per hour which the machine requires. Hence, the inventor concluded to rebuild two of his tractors and put on gasolene or oil engines having a cooling device of his own, which renders a small quantity of water sufficient to keep the cylinders from overheating.

A Motor Vehicle Museum.

Velo, one of the leading bicycle and motor journals of Paris, suggests that a motor vehicle museum be established in that city, where all the old and experimental types of vehicles could be preserved and kept on exhibition Many of these interesting first attempts are now lying neglected in storehouses or out-of-the-way places, where they are fast deteriorating. Steps cannot be taken too soon to rescue them from their oblivion, Velo thinks, and recommends, that efforts be made to interest wealthy amateurs in the project of forming a company with a small capital to collect the old models, rent suitable premises, and open a permanent motor vehicle museum, which would increase in number of exhibits and in value as time passed.

The suggestion is certainly timely, and should be followed also in this country at no distant day.



TRUSSED AGRICULTURAL TRACTOR, G. H. EDWARDS, CHICAGO, ILL.

FOREIGN NOTES.

The Spring tour of the Motor Car Club has been set for April 27.

E. J. Pennington is promoting a motor factory at Dublin, Ireland. The prospectus states that several thousand hands are to be employed, and that enough motors and vehicles to supply the universe are to be turned out.

A company entitled the Maxim Motor Company, Ltd., has been registered in England, with a capital of £7. The Maxim referred to, we understand, is Hudson, not Hiram Maxim of the Maxim-Nordenfelt Guns & Ammunition Co., Ltd.

The Anglo-French Motor Carriage Company, Birmingham, England, have nearly completed their new plant, and will soon be in a position to supply orders promptly. They are giving special attention to delivery wagons, the first installment of which they are now testing.

Several French inventors are bringing out motors that may be attached to present styles of vehicles and thus save owners the expense of buying new vehicles complete. The large cab and delivery companies of Paris are particularly anxious to secure a practical motor of this class.

The editor has received from Ludwig Lohner, of Vienna, Austria, a pamphlet containing an address on the "Past, Present and Future of the Motor Vehicle," delivered by Mr. Lohner before the Lower Austrian Trades Congress early in the present year.

A Benz motor carriage was recently imported into Pretoria, South Africa, by Hess & Co., commission merchants, of that place. President Krüger took a ride in the new conveyance, and was so well pleased with it that he presented to the importers a gold medal suitably inscribed.

Italy can now boast of a motor club, an organization called the "Club Automòbilisti Italiani" having been formed at Milan with over 50 members. King Humbert, who is an ardent advocate of the motor vehicle, has given the club permission to make use of the Royal Park of Manza, a short distance from Milan, on its first excursion.

The Australian Cycle & Motor Car Company, Ltd., announce that they intend to start a factory at Melbourne to manufacture motors for the carriage trade. The company claims to have exclusive Australian rights, under a number of valuable patents, among which the Pennington is specially mentioned.

In France great interest is now centering in the pseudo rotary motor of Paul Auriol, a mechanical engineer of 23 Rue Godat-de-Mauroi, Paris. A manufacturer of motor carriages at Lyons is placing one of the new motors on a vehicle, which it is expected will soon be ready for trial. The details so far given out are very meagre, but the oscillating principle is said to be the basis on which the inventor is working.

The new catalogue of the Anglo-French Motor Carriage Company Ltd., Digbeth, Birmingham, England, illustrates 14 different styles of vehicles for which they are prepared to take orders. These include dog carts, phaetons, cabs, barouches, doctor's broughams, omnibuses of different capacities, delivery wagons and trucks. Full particulars of the vehicles accompany the cuts, and the introductory remarks are a model of conciseness and good taste.

The Daimler Motor Company have removed their London office from 40 Holborn Viaduct to 219 to 229 Shaftsbury Avenue, W. C.

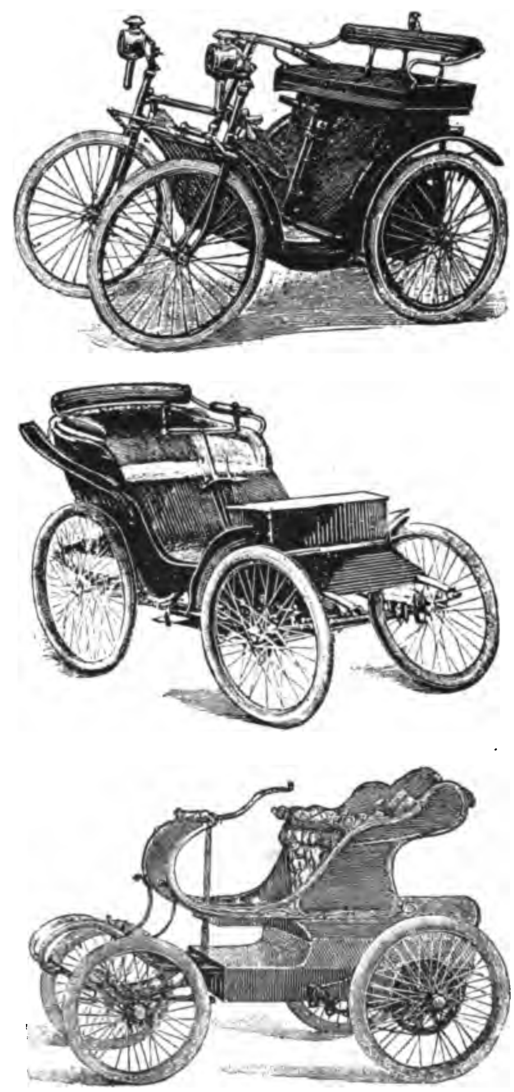
Cohendet & Co., 166 Quay Jemmapes, Paris, are said to be building an acetylene motor of 10 horse-power after a design by Raoul Pictet.

Accles, Ltd., Birmingham, England, are building an addition to their works for the exclusive manufacture of motor cycles and motor carriages.

G. Kynoch & Co., Wilton, Birmingham, England, have incorporated, with a capital of £500,000, under a charter empowering them to manufacture motor vehicles.

The Imperial Victorian Exhibition to be held at Crystal Palace, London, in May will comprise a motor vehicle section, as it did last year. No entry fee will be charged.

Hiram S. Maxim, of flying machine fame, is at work on a gas engine, which can be regulated and reversed like a steam engine. He is also endeavoring to produce a light steam engine and boiler for boat and vehicle use.



SOME RECENT FRENCH MODELS.

The Langer Motor Vehicles.

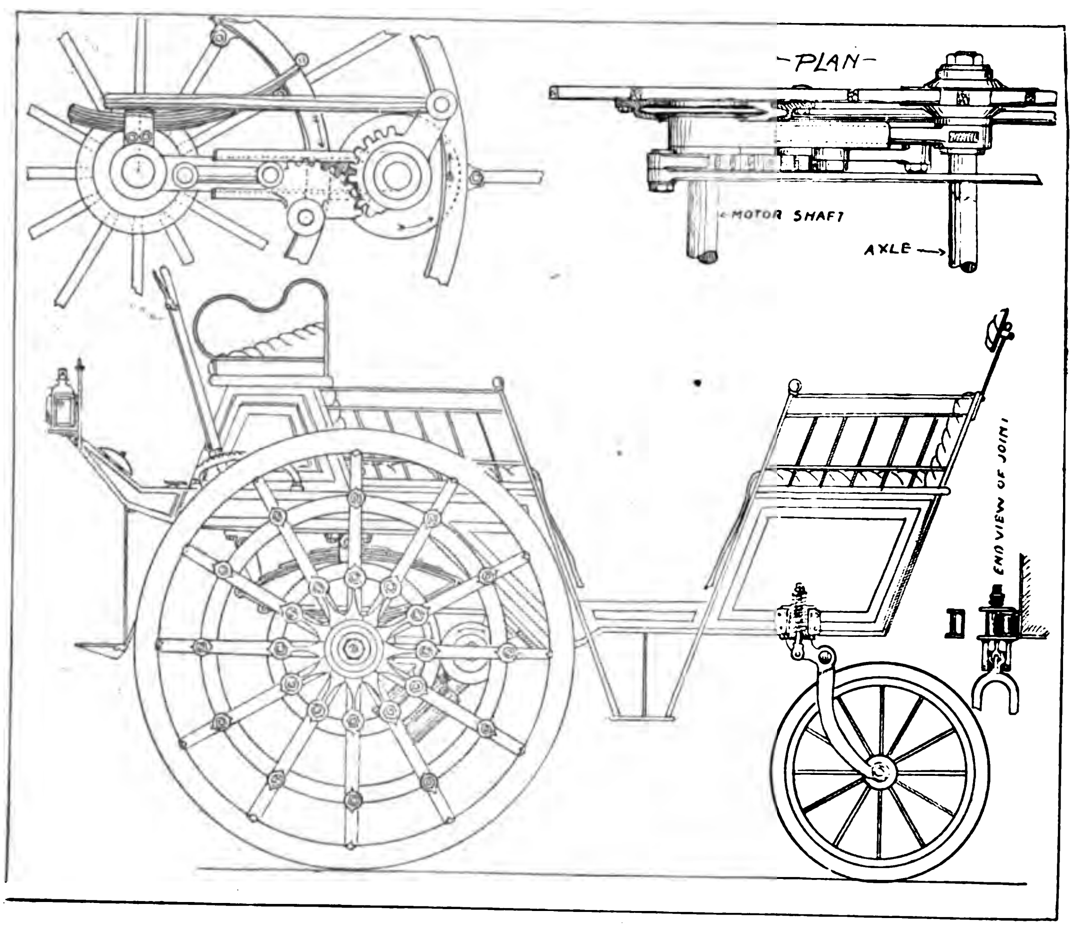
G. Langer, a mechanical engineer of St. Louis, Mo., is the designer of two different types of motor vehicles illustrated herewith. The one with the large drive wheel is the first which he constructed, in this entrance is effected through the wheel or at the end of the wagon. As the wheel is seven or eight feet in diameter, obstacles in the road are easily surmounted, and the inventor claims that there is little need of springs on the body of the vehicle, spring seats being sufficient. The large size of the drive wheel also permits of a high speed without endangering the rubber tires.

The body of the wagon is supported on the inner rim of the hubless wheel by means of rollers, whose size depends upon the speed the wagon is intended to run. The rollers are on ball bearings. By means of a friction clutch the motor shaft directly engages in the beveled rim or rib of the hubless wheel, thus dispensing with intermediate gears or sprocket wheels and chains. This clutch is manipulated by a lever. Each wheel is controlled by a separate lever at the side of the driver's seat The wagon can easily be made to turn by applying the power to one wheel and braking the other. The same lever, after releasing the friction on the wheel clutch, will set the brake shoe.

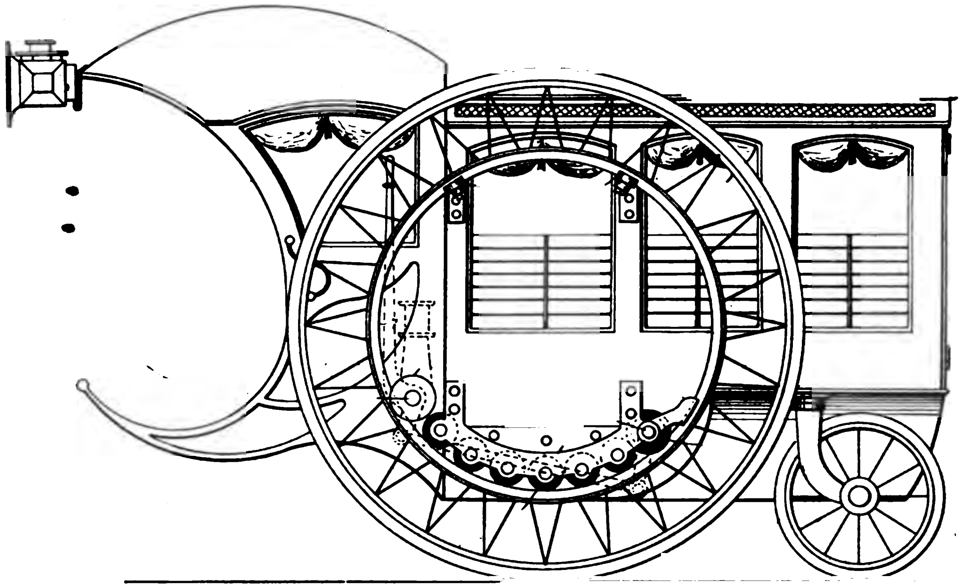
In this construction a reversible motor is necessary, the reversing being done by the driver's foot.

Mr. Langer's second idea of a motor vehicle calls for wheels of the usual size, the drive wheels being placed either in front or in the rear, according as the bulk of the weight is carried in front or in the rear. Each of the two large wheels has two concentric channeled rings fastened on its spokes or in any other suitable way. Between the two grooved rings (the groove to be beveled) the friction disc on the end of the motor shaft runs on a feather. The wheels are by the device shown in the drawing shifted, so as to bring the friction disc in contact either with the outer or inner rim, reversing the motion of the wagon. Two levers are used here also, one on each side of the driver. The wagon is turned by moving the levers in opposite directions. The trailing wheels are on a specially designed truck. The friction driving discs have a side play on the feather on the ends of the motor shaft. By a peculiar method of shifting it matters not how much the wagon body may rock; it will not interfere with the applied friction, or in other words, it makes no difference how much swing is in the body the amount of frictional contact will remain under all conditions the same. This invention dispenses with a reversible motor. A patent is said to have been granted on it Feb. 27, 1897, but is not yet issued.

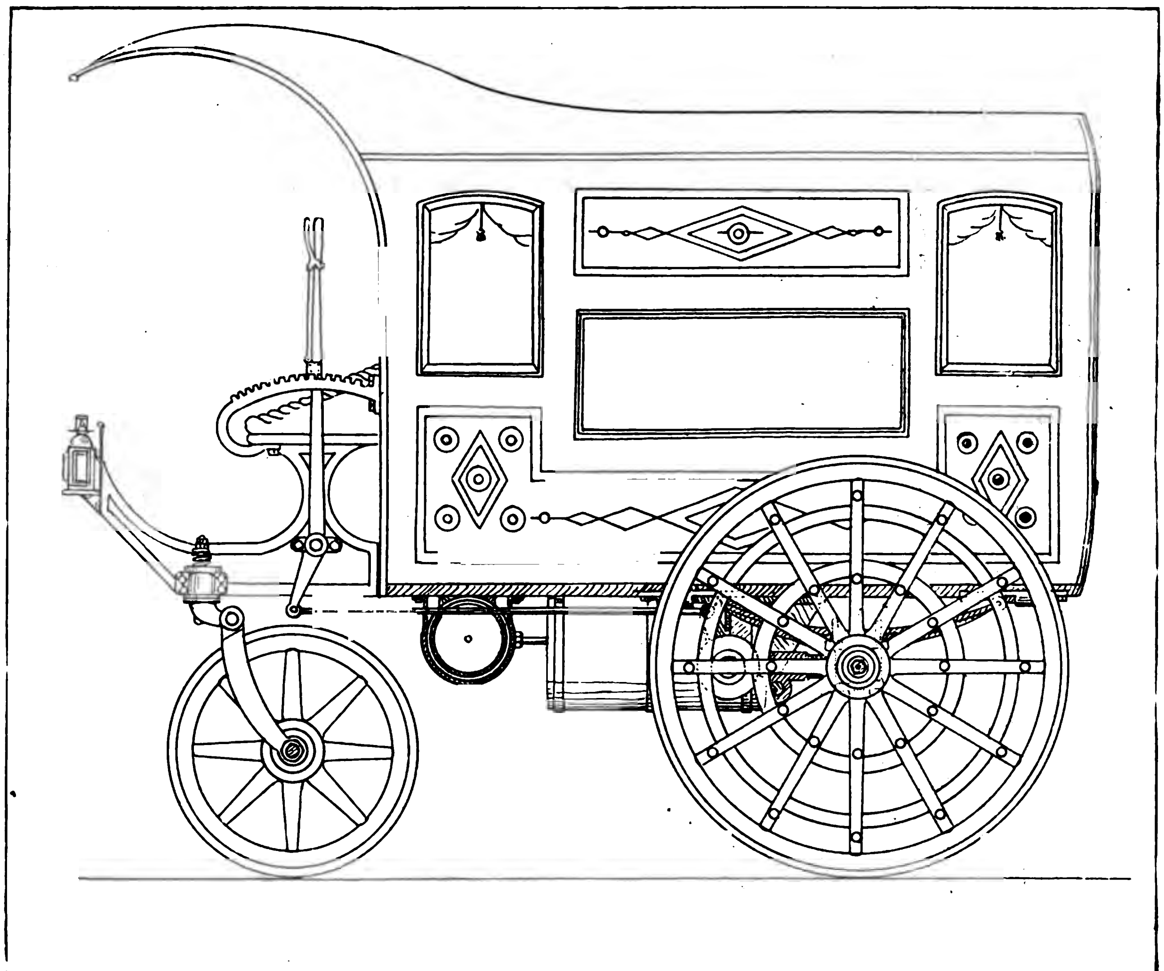
Mr. Langer has another application pending on the construction of a third wagon, of which he promises particulars later, as also of a new rotary gasolene motor which he has commenced to build.



TRANSMISSION DETAIL. G. LANGER, ST. LOUIS MO



FIRST DESIGN OF G. LANGER, ST. LOUIS, MO.



SECOND DESIGN OF G. LANGER.

The Annual Sportsmen's Exhibition.

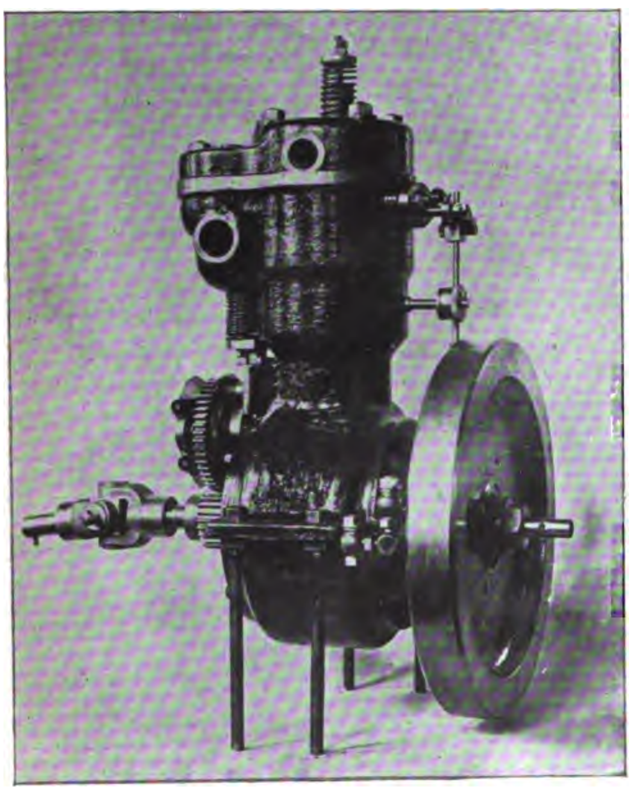
The Sportsmen's Exhibition, held at Madison Square Garden, New York City, early in March, showed a marked advance over that of the previous year in launch and marine motor exhibits.

The exhibitors in this branch were the New York Yacht, Launch & Engine Company, New York City; the Pennsylvania Iron Works, of Philadelphia; the American Motor Company, New York; the Daimler Motor Company, Steinway, L. I.; the Marine Vapor Engine Company, Jersey City, N. J.; the Gas Engine & Power Company, Morris Heights, N. Y.; the Manhattan Manufacturing Company, New York, and W. H. Mullins, Salem, O.

The New York Yacht, Launch & Engine Company's exhibit consisted of an 18-foot launch propelled by a two-hp Wing gas motor, a rowboat, and a 22-hp Otto marine motor, for which this company acts as agent in New York.

Several "Globe" gas engines and a launch fitted with the same power were on view at the stand of the Pennsylvania Iron Works.

At the stand of the American Motor Company the showing was quite varied, consisting of a five-hp marine motor, a four-hp and 1½-hp stationary motor, a portable boat motor, full rigged to apply to the stern of a small boat and a 10-foot boat fitted with a phosphor bronze motor of 1½ horse-power. A novelty which attracted a great deal of attention here was a reversing mechanism for boat motors, which was very simple and compact.



MANHATTAN GAS ENGINE.

The Daimler Motor Company showed one of their handsome 32-foot launches a new model motor carriage from the parent works of the Daimler Company, in Cannstatt, Germany, and a stationary kerosene motor.

The Marine Vapor Engine Company, had the most extensive stand at the exhibition, large enough to accomodate four of their Alco Vapor launches of various dimensions. A motor was also shown separate and the management of it fully explained to visitors.

Two naphtha launches constituted the exhibit of the Gas Engine and Power Company, and W. H. Mullins, manufacturer of manganese bronze, aluminum and galvanized steel small boats, showed a number of hunting boats and yacht tenders, with which he is now prepared to furnish motors.

The Manhattan gas, gasoline and kerosene engine, placed upon the market for the first time, at this show, is claimed to be the direct result of experience gathered during a period of 15 years in the designing and manufacturing of gas engines from 1 to 250 horse-power. It is of the Otto cycle type. The ignition, which is electric, is accomplished by a touch and break away of the contact points. The shaft is a steel forging and runs in oil, contained in the base of the engine. The bearing throughout and connecting rod are of phosphor bronze, scraped to a bearing. The wrist pin is hardened steel. The valves are of the poppet type, positively actuated by hardened steel cams. There is a sensitive governor, to prevent racing.

For launch use, a universal coupling is introduced between the enging and propeller shaft, to eliminate the friction which is bound to occur, should the engine keelsons warp, and throw the shafts out of line. There are also ball bearings, to take the forward and reverse thrusts.

For reversing the boat the 1, 2 and 4 horse engines are equipped with propellers whose blades may be reversed, so that by simply shifting them, the boat may be driven in either direction, the engine running all the while in one direction.

The cut shows the 2 horse-power engine complete, the weight of which is said to be 175 pounds.

The Manhattan engines are manufactured by the Manhattan Manufacturing Company, of New York.

Another Race at Providence.

The management of the Rhode Island State Fair Association announce that they intend to hold motor carriage races at Narragansett Park, Providence, R. I. on Sept. 6, 7, 8, 9 and 10. The rules governing the contest arenow under advisement.

The first issue of my "want ad." put me in communication with a large number of manufacturers both in the United States and Europe. In fact, I do not think that any manufacturer of importance has not written me in answer to my "ad." in The Horseless Age. N. Escalante y Peon,
Merida, Yucatan. *Manager of Railways.*

A Chappie and a Horseman Try the New Horseless Carriage.

(*New York Journal.*)

In search of a new sensation not inconsistent with a proper observation of Lent, I went yesterday and rode in a horseless carriage. I don't regret the experiment. After the first flush of the thing, and barring the familiar aspect of the dashboard, the harness and the horse, it was not unlike riding in an ordinary hansom, for all the carriages in the place that I went to are built on the hansom plan, which is to say that they are the homeliest vehicles that were ever invented.

But it is in that first sensation that you get your novelty. It is as though you were being served with a "high ball," without the ball. There is a sense of incompleteness about it. You seemed to be sitting on the end of a huge pushcart, propelled by an invisible force and guided by a hidden hand.

There is also a seeming brazenness to the whole performance. I dreamed once that I walked down Fifth Avenue in my pajamas in the full tide of the afternoon promenade, and I almost died with shame before I awoke. Yesterday I had something of the same feeling as I sat there and felt myself pushed forward into the very face of grinning, staring and sometimes jeering New York. But it wore away after a while. Gradually I felt that I did not need the protection of a horse in front of me. I returned the wicked glances of the bicycle ladies on the Boulevard, and when I got back to Fifth Avenue I was almost as much at home and felt almost as devilish as the other chappies whose faces were glued to club windows, and whose eyes were riveted on the beautiful river of femininity that sweeps in counter currents along our main thoroughfare of fashion.

The fellow who sold me the horseless carriage said that there was no call for such vehicles from the clubs, a statement that I do not doubt. Your club chappie likes novelty, but he doesn't want the whole world to watch his indulgences in that direction. He has a reputation for conservatism that he must preserve. He will ride in a horseless carriage by and by, but it will be when to do so will attract no more attention than to ride a bicycle. I know two or three chappies who have tried the horseless carriage, but it has been after dark and along streets where the electric lights were not too bright.

I believe that I am the first representative of dudedom who has ever ridden in a horseless carriage in the garish glare of day. I congratulate myself that I survived the ordeal. At one time I thought the nasty little boys who throng the unaristocratic avenues where I went first to avoid my acquaintances were going to stone me. They ran after me and hooted and cast pebbles and otherwise evinced derisive hostility to such a degree that I begged the motorman to make haste to the Boulevard where I hoped to find protection among the many other strange and curious things that swarm there on wheels. I was right. Only the horses paid any attention to us on the Boulevard. Elisha's chariot of fire wouldn't create the slightest ripple of excitement on the Boulevard.

On Fifth and Madison Avenues surprise was expressed by an aristocratic elevation of the eyebrows, except among my personal acquaintances, whose startled faces indicated their fear that I had gone mad. The horseless carriage will have to be improved before it becomes popular in chappiedom. There must be some sort of a guard in front to keep clubmen from tumbling out on their way home after 3 A. M. There must also be some sort of a screen for Summer night driving in the Park. As the vehicle is now constructed there is altogether too much publicity about it. The chappie's dearest prerogative is his privacy and he is going to preserve it, horse or no horse.

CHOLLY KNICKERBOCKER.

Cholly Knickerbocker may like it, for it certainly catches the eyes of the girls, and it may perhaps suit the other chappies, or even the hardened frequenters of the bargain counter, but —and this is a most important "but"—I do not think the motor cab will ever be anything more than a fad. New York is a blase city, and already, except where fashion reigns, or the other extreme, the tenement house population, holds sway, the horseless cab attracts little or no attention. Still, in its present usual form—that of a hansom cab sawed off short of the dashboard and stuck on in front of a truck—it gives the occupant a hopeless sensation of being perpetually shot through a chute, with the pleasing possibility of being utilized as a battering ram in a collision with a cable car or a runaway team.

There is absolutely no comparison between the exhilarating thrill of driving a fleet footed trotter or stylish stepper and the sitting cooped up at the mercy of the individual who is in charge of the electricity. Electricity, by the way, is the motive power generally used for these automobiles, and the only power that has been used here for the hansom cab style of conveyance. This leads up to a point that is quaint. The horseman knows that his horse has a limit of endurance, but he also knows that the animal's powers can be husbanded if necessary. On the other hand, when you start for a trip—it can scarcely be called ride or drive—in a motor cab, you have to order your stored electric force to suit the length of your journey. The which might be rather awkward under such circumstances as missing your way on a country road.

Another point that provokes a smile, even from the trussed travelers on a horseless hansom—for one needs to be undersized to fit them as at present constructed—it is that wheelmen seem to dislike the apparatus even more than horses. The horses, especially when they are well-bred trotters, regard it rather curiously, but on the whole contemptuously; but in the bosom of the average cyclist it seems to arouse derision, scorn and contempt. An occasional cab horse, doing his level best under the lash, may not see the strange machine till close to him, and in the excitement of the moment endeavor to cut a somersault, but as a rule the New York horses are already accustomed to this new, strange thing, especially those that would seem most likely to be scared, the well-fed occupants of private stables. The wheelmen sneer at the contrivance, spurt by it to show their contempt for its traveling powers and then slow up again to get another chance to cast a glance of unaffected disgust.

Viewed simply and seriously as a means of locomotion, the motor cab has fewer disadvantages than would seem probable at first sight. When I had the pleasure of appearing before the public side by side with Cholly Knickerbocker the cab was certainly carrying top weight—some 425 pounds. Some excuses might therefore have been made for it, especially as the weight in front was not counterbalanced by any great avoirdupois on the part of the—engineer, jehu, driver, electrician or whatever one should call the man in charge. Nevertheless, the cab was well under control, stopping or slowing without delay or spurting along directly it was called upon. It "steered" well, too; nor were ruts, holes or car tracks any apparent obstacle, the driver having to take no greater care to avoid them than he would have if he had had a horse between the shafts.

The chief trouble with the motion of the cab is that on smooth going, such as asphalt, the thick rubber tires do not give sufficient fulcrum to keep the vehicle moving steadily. The consequence is what would be called "weaving" in a horse, an irregular wobbling from side to side. This is not at all apparent on cobblestones, and over these there is far less jarring than would be expected.

Still, whatever merits these motor cars may have, it is difficult to imagine that they will ever hold the affection of any one who has ever sat behind a free-going roadster.

FRANCIS TREVELYAN.

Kind Words from Distant Lands.

I like your journal. It is most interesting, and I hope it will become a popular paper.

W. J. V. HASLUCK,
The Nettles, Bell Block,
NEAR NEW PLYMOUTH, NEW ZEALAND.

I am too much pleased with your paper to miss a single number of it.

F. V. A. DE STUERS,
Sugar Factory, Near Kemaugleu,
TAGAL, JAVA, NETHERLAND, INDIA.

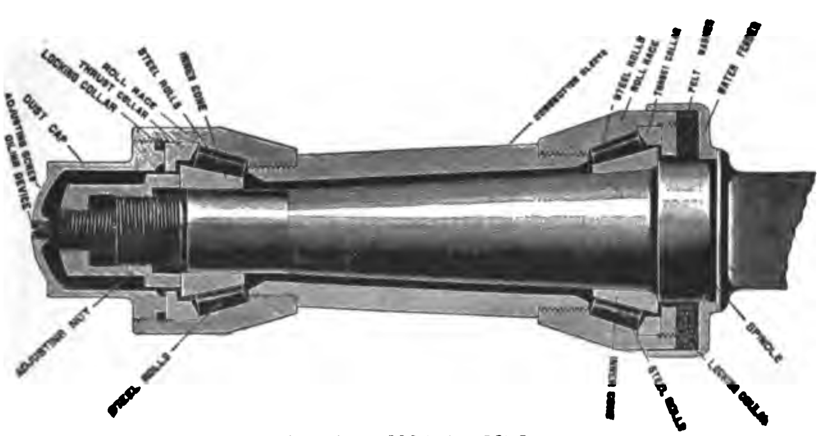
We think your journal one of the most interesting yet published in respect to motor carriages.

ANGLO-FRENCH MOTOR CARRIAGE CO., LTD.,
(Digbeth) BIRMINGHAM, ENGLAND.

The Grant Roller Bearing.

The patent records show great activity now in that branch of invention pertaining to anti-friction bearings for bicycles and vehicles in general. One of the most noteworthy results of this activity is the Grant roller bearing, which is now being placed on the market by the Rubber Tire Wheel Co., Springfield, O. The principle of this new bearing, as will be seen from the cut, bears a close resemblance to the conical rolls already successfully employed in bridge engineering.

The manufacturers claim for it simplicity, ease of adjustment, strength, durability and freedom from end thrust.



GRANT ROLLER BEARING.

CORRESPONDENCE.

Experiments with Ignitors and Vaporizers.

Editor Horseless Age.

DEAR SIR: Your very interesting paper is looked forward to every month, especially the articles contributed by those experimenting on hydro-carbon motors. I have been experimenting on these motors for about three years, and it is to me the most fascinating work I have ever undertaken.

About a year ago, being aware of the difficulties and drawbacks of electric ignition for internal combustion motors, especially in the hands of the inexperienced, I began experimenting on hot-tube ignitors suitable for high-speed two and four-cycle motors. After a number of experiments, the details and disappointments of which I will not describe, I devised a poppet valve, leading direct into the inlet of the hot tube. This valve is actuated by a lever, the lever by a plunger, and the plunger by the piston On the outside of the cylinder head is a yoke. Where the plunger passes through the cylinder head is a stuffing box; above this and inside the yoke is a spiral spring, which forces the plunger down, closing the valve after the piston raises the plunger. This device shortens the inlet to the hot tube to the thickness of the cylinder head, but I drop the opening a little below the head, so as to get well down into the charge to be ignited; the piston being on the slowest part of its travel when striking the plunger, there is no shock, but the valve opens and closes without any pound or noise. I have run a motor as high as 700 revolutions per minute without misfires. To adjust the head of the valve there is a cap and jam nut on the lower end of the plunger, the proper lead in order to get the full power of the engine, being about one-eighth of the revolution.

All the parts are made of cast steel and I find after steady running are not affected by heat. This ignitor can be attached to any motor, either two or four cycle, and is very smooth and positive in action, as it is not dependent on eccentrics or cams for its motion and never gets out of adjustment.

I have also concluded a series of experiments with a vaporizer in which the gasolene flow is controlled by the suction of air. After I have my gasolene valve thoroughly regulated the motor maintains a steady speed. When the engine stops the gasolene is shut off, there being no possibility of an escape of gasolene through forgetting to close the valve.

The tendency seems to be to build motors too light. They should be heavy enough to wear well and withstand the strain of the explosions.

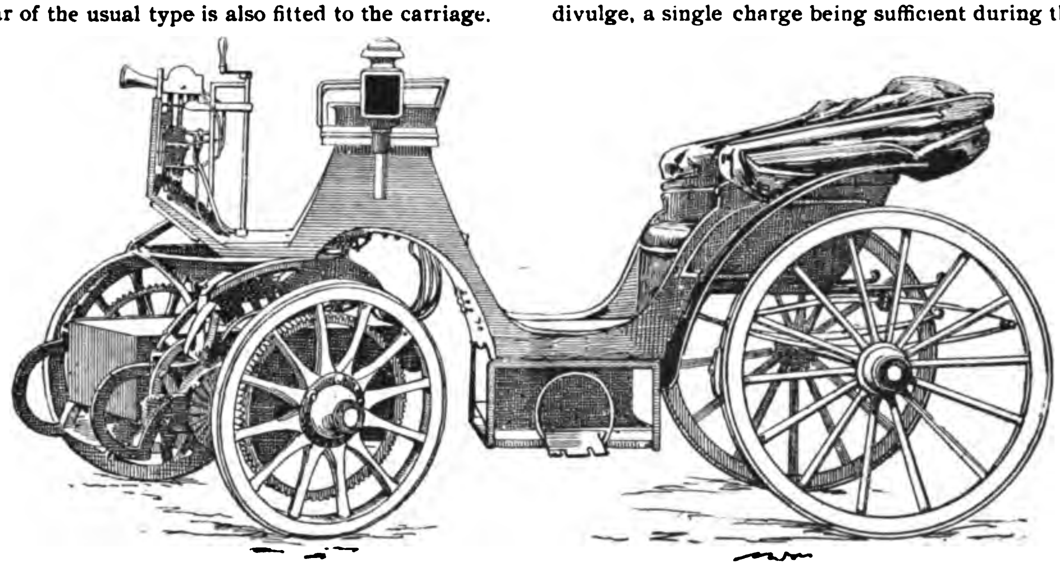
JOHN J. OHRT.

Burlington, Ia.

The Krieger Electric Carriage.

At a recent meeting of the Société des Electriciens, of Paris, M Krieger read a paper on a number of electric vehicles he has been experimenting with, among them two for public service, one of which is here shown.

For his first carriage M. Krieger took an ordinary horse carriage such as is in use in the streets of Paris, and applied an electric motor to each of the fore wheels. To the armature shaft of each motor is attached a pinion with helical teeth engaging with a similar wheel rigidly attached to the corresponding driving wheel. The ratio of gearing is as one to ten. The field magnets of the two motors are coupled in series, and the two armatures in parallel. The use of an independent motor to each driving wheel enables the steering to be effected electrically. For instance, if the armature of the motor on the inside of the curve it is desired to traverse be short-circuited, the fore-carriage will turn to that side. The short circuiting is brought about by means of a special commutator arranged for this purpose. The fore carriage turns to an angle equal to that made by the steering handle. Hand steering gear of the usual type is also fitted to the carriage.



THE KRIEGER ELECTRIC HACK.

The second carriage was made by transforming a cab belonging to the Compagnie l'Abeille. It weighs 2,535 pounds, and has taken trips of 20 miles without recharging the battery of Fulmen accumulators, which in itself weighs 628 pounds. M. Krieger very naturally points out that the ancient build of the carriage, constructed ten years ago, for horse traction, shows his system at a disadvantage, owing to the great strain on the fore-carriage, which was not designed for such a purpose.

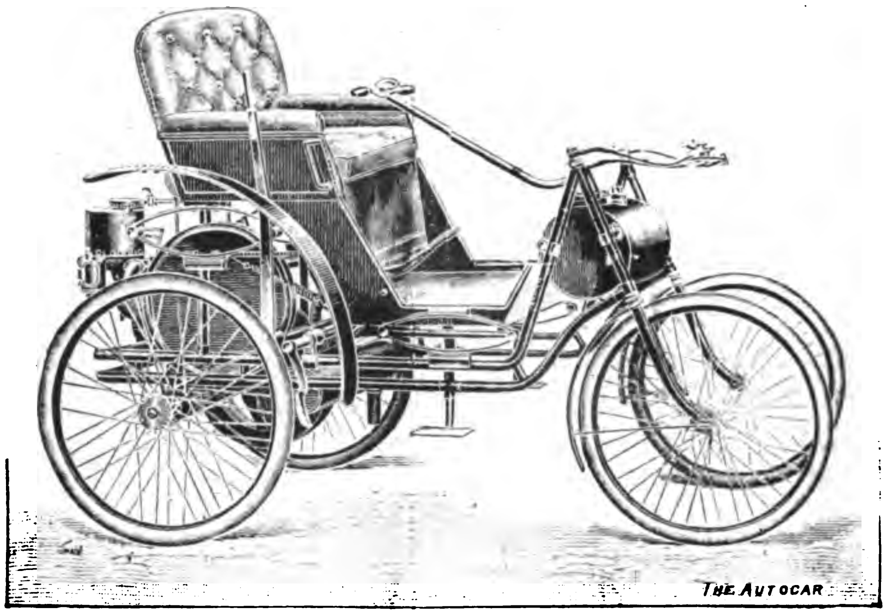
Another carriage, especially constructed for electric traction, weighs when empty 4,144 pounds. This includes the weight of the fore-carriage, which is 3,593 pounds, and it is possible to travel a distance of 50 miles without recharging the batteries. This battery, especially designed by M. H. Meynier, commercial agent for the Julien accumulators, has a capacity of 450 ampere-hours, with a total weight of 1,410 pounds. It consists of 16 cells, each weighing 33 kilogrammes, and enclosed in an ebonite case having three compartments. Each compartment contains 13 plates, 6½ millimetres in thickness, that is to say, 39 plates per element. The capacity being 450 ampere-hours about 15 ampere-hours per kilogramme of plates is obtained. The ebonite cells are protected by thin oak boxes. A layer of special luting is poured on to the surface of the liquid of each cell. This composition, once dried, performs the function of a thin sheet of slate, sealing the cell hermetically, and preventing splashing over, which is one of the serious drawbacks in the carrying of accumulators by road. Two motors of 150 kilogrammes, running at an angular velocity of 600 revolutions per minute, give a maximum couple of 13 kilogrammes, the normal couple being 1.5 kilogrammes. The rate of discharge of the accumulators is from 60 to 80 amperes, at 30 volts on the level, at a mean speed of six to eight miles per hour, and the ame speed can be maintained over ordinary gradients. With a load of five passengers this carriage has run 40 miles at an average speed of seven miles per hour. It has also covered a distance of 15 miles in the suburbs of Paris at an average speed of six miles per hour.

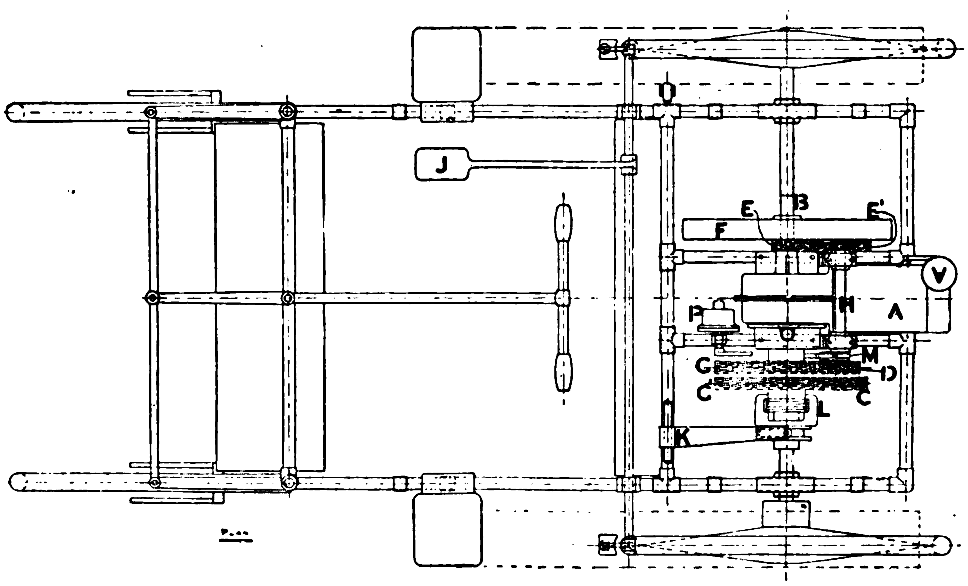
M. Krieger is having constructed an ordinary brougham with two seats, which is to travel 75 miles without recharging and is to weigh only 1,723 pounds 350 of which are for some new accumulators, the name of which M. Krieger does not divulge, a single charge being sufficient during the night.

British Motor Syndicate Shareholders Sue.

The *Automotor* states in its latest issue: "The action by the subscribers to the British Motor Syndicate is progressing as rapidly as legal procedure will permit. The actual plaintiff is Mr. Malcolm Wagner, the defendants being the British Motor Syndicate, Messrs. Harry J. Lawson, Thomas Humber, H. H. Mulliner, Prince Ranjitsinghi, Lord Norreys, and Thomas Robinson, all directors of the Syndicate. The writ, issued on Feb. 17, will be supported by Sir Edward Clarke as leader. The plaintiff claims to have his name struck off the register of shareholders, and also asks for damages and the return of moneys which he was induced to subscribe through alleged misstatements in the prospectus. Mr. Wagner is nominally the only plaintiff, but we understand his expenses will be divided among a number of subscribers who are in the same unfortunate position as himself, this being practically a test action which will govern the rest of the subscribers' rights."

It is also reported that a like movement is on foot among the shareholders of the Great Horseless Carriageless Company.





ROOTS' PETROCAR. (FROM "THE AUTOCAR.")

Western Invention.

UNIQUE ENGINE FROM WHICH THE GREATEST RESULTS ARE EXPECTED.

An invention which promises to revolutionize horseless carriages and flying machines, so far as motive power is concerned, was exhibited at the foot of Bremen avenue yesterday afternoon. It is the invention of Peter Hersel and James Buttrell, and, with the aid of James S. Reardon, of the Reardon Glue Company, it has been perfected.

The engine is unique in many ways. In the first place, it occupies but little room, the floor space taken up being only 4 feet in length by 6 inches wide. The engine exhibited yesterday took up only this small space, and weighed only 400 pounds while it furnished 25 horse-power without any apparent effort. A dynamo of 100 voltage, which has required an 1,100 pound 10-hp engine to run it, was started and kept at this figure without the least difficulty, not only furnishing the power for the motor, but lighting through it the glue and hair factories of J. S. Reardon, which extends over two blocks. This experiment was made while the engine was on an insecure basis, and in such a position that it was not considered safe to run the engine at its highest speed. Still, a speed of 1,800 revolutions a minute was attained with a 90-pound steam pressure, and the exhaust is so small that it is evident that a much smaller pressure would produce the same power without change in the mechanism.

The wonderful part of this engine is that it does away entirely with the connecting rod, and has no back pressure in the steam chest. The pressure works direct from the piston on to the fly-wheels, and there is, therefore, no loss in the exhaust. The cylinder is only a 5-inch bore, and the stroke is but 4 inches, but the double cylinder pressure from the centre creates a vacuum which forces the piston back by atmospheric pressure. The inventor claims that he can make a similar engine which will weigh only 100 pounds, and yet be capable of producing 15 horse-power with less than 40 pounds of steam. If this is true horseless carriages and flying machines are only a question of time.

In ordinary machines steam enters the chest at two points, forcing the piston rod back and forth. Here the inventor has utilized the high revolution to push the piston back into the chamber by its speed alone. The engine really comprises a double cylinder, thus using the steam which usually becomes exhaust to force the extra piston out. A new style governor, on which a patent has been issued is, of course, the main factor in the utilization of this power wasted in ordinary engines. It renders the exhaust very small, a fact which is of great importance for horseless carriages, as in such vehicles now it is the exhaust which frightens horses on the streets. Doing away with the connecting rods also saves the use of oil on the slides, and the fact that two pistons are used in the one cylinder does away with all the pounding, the pressure being all one way, and this in turn does away with packing the box. Owing to the compactness of the engine there is no pounding, and the rotary valve, which can be used with success only on a double cylinder expansion, prevents the gathering of water in the cylinder.

Owing to the peculiar construction of the engine the owner may run one belt or four, as is best suited for his business, and the fly-wheels are easily interchangeable, according to the amount of power and the number of belts desired, while the speed will increase as the size of the steam entry is increased and the number of directing forces are lessened. The engine is especially adapted to light work, such as dynamo driving and in horseless carriages, and, on a lighter scale, is expected to be of great use in locomotive service, as the steam exhaust wasted in a locomotive is great. This exhaust may be used to nearly double the power of the engine.—*St. Louis Globe-Democrat.*

The Roots "Petrocar."

Under the above somewhat ambiguous name, Roots & Venables of London, England, are manufacturing a light vehicle of bicycle construction, employing kerosene instead of gasolene as a motive fluid.

The single-cylinder motor is attached to the back axle. The frame is of cold-drawn steel tubing and the front wheels, which are attached after the manner of the front wheel of a bicycle, are connected together by links so that they may be operated by one handle.

The tubes of the frame are used to convey the water from the motor to the water tank, which is placed between the front wheels. The large radiating surface thus obtained cools the water so rapidly that a small quantity suffices.

Elliptical springs support the body of the carriage and the wheels are fitted with heavy pneumatic tires.

The motor, weighing about 135 pounds, without flywheel, develops three horse-power, running at 550 revolutions per minute. Instead of gear wheels a silent chain is used to operate the valves, making the motor almost noiseless.

The motor measures off a certain fixed quantity of oil for each working stroke. This is mixed with air, and both are simultaneously heated and mixed by passage together through the vaporizer, whence they pass into the cylinder. The return stroke of the piston compresses the charge into the red-hot platinum ignition tube, which fires it, thus effecting the working stroke. The crank pin is entirely enclosed, and all lubrication is automatic. The motor requires no attention so long as it is supplied with oil, except that the cooling water requires renewing after four hours' run. The carriage for two persons, as illustrated, with a three horse-power twin-cylinder motor, is fitted with chain and friction clutch gear to drive it at about twelve miles per hour. The carriage for four persons is geared to travel at about eleven miles per hour.

In the plan of the carriage shown, *A* is the cylinder, *B* the crank shaft, geared to the wheel *E* by means of the silent chain, this wheel being on the rotating valve shaft *H*, which is made large enough to transmit the power either by the chain on the small pinion *D*, or the larger one *C*, either of which is thrown into gear by means of a clutch at *L*.

The oil supply is at *O*, and the vaporizer at *V*. *J* is the foot lever commanding the brake, and a vertical lever enables the driver to throw the motor in or out of gear, or to give the carriage one or the other speed.

In the first illustration, which shows the outward appearance of the "Petrocar," a case which covers the working parts, is removed for the moment to make the arrangement of the machinery more plain.—*The Autocar.*

Messrs. Philipson and Toward's No. 1 Steam Carriage.

On the last Saturday in February there was a semi-private assembly at the carriage building factory of Messrs. Atkinson & Philipson, Newcastle, to inspect a new motor-carriage, locally invented, designed and built, and, as to parts, patented and registered. The new autocar is the joint production of two well-known Tyneside firms—Messrs. Toward & Co., engineers, St. Lawrence, and Messrs. Atkinson & Philipson, the eminent Newcastle carriage manufacturers. The later firm have supplied the carriage and wheels and the former the motor. The joint production is a smart wagonette, well designed and of compact appearance, while the motor is apparently equally satisfactory. and in actual trial in the yard gave promise of performing efficiently on the road. As the first productof its designers and builders, however, it was interesting mainly as giving a concrete illustration of the ideas which will probably prevail for some years in regard to the new mechanical road locomotion. In the north of England there have not been many motor-cars seen in public at all, and the majority of those that Northumbrians have had an opportunity of seeing in public have not been such as to inspire much confidence or hope for the future of motor traffic they have been chiefly gosolene motors of French or American pattern and manufacture, and have been unpleasantly odoriferous. For the purposes of French autocar competitions, oil seems to have been a greater favorite than steam as a motive power, electricity not yet being a practical competitor; but in England the gasolene motors have not found so great favor as steam is likely to receive when the numerous inventors who are busy with steam road carriages show what are the capabilities of the older power. Messrs. Toward & Co.—there are three partners who have interested themselves in the design of the motor exhibited, and one of them, Mr. Meek, is a fairly old hand at the game, for he made for himself 10 years ago a very workable steam tricycle—and Messrs. Atkinson and Philipson have designed a very strong and neat frame for their autocar, all the parts of which are admirably fitted for their purpose. Instead of taking a normal carriage or trap and storing the motor somewhere about it, they have taken the motor and built the carriage round it. Mr. John Philipson, and his two sons, Mr. Wm. and Mr. John Philipson, are adepts in their art, and, while not abandoning the old principles of carriage construction, they have designed a special framework which admirably supports the motor, while at the same time carrying passengers somewhat after the style of a four-wheeled dog-cart or wagonette. As to the motor, no one who saw it at work could doubt for a moment the immense preference it must possess, other things being equal, over any kind of oil motor. Smoothness of motion, absence of vibration and smell, and simplicity of handling were at once evident. Probably something else than the rubber-tired wheels will be required to save the motor itself from the effects of the shock and concussion of rough roads, and perhaps in future carriages a similar arrangement of springs to that which protects the body of the carriage will be fitted to the motor. In the carriage now made the fuel used is coke, but the intention is to employ petroleum. The boiler is of the water-tube type, and super-heated steam is obtained somewhat after the same style as in the Serpollet generator, thus dispensing with ordinary boiler fittings, such as water gauges, valves, air gauges, thermometers, etc. Before starting the furnace is lighted, and the boiler tubes—which, however, are not flattened, as in the case of the Serpollet generator—arranged spirally, reach a red heat. A hand pump is employed to force into the boiler just sufficient water to supply the requisite amount of steam—which is instantly generated—and, when once a start is made, the water is pumped automatically in fixed quantities into the generator. From the time of lighting the furnace steam can be got up in about 20 minutes. Once the furnace is going, however, a few seconds' pumping suffices to start the engine. The engine is of the compound type—the two cylinders being placed on each side of the boiler between it and the hind wheels—and drives a shaft from which the power is communicated to the axle of the rear wheels by a roller-chain of bicycle pattern. Here a very ingenious differential gear is fitted. The engine is three horse-power, and the weight of the whole carriage, motor included, is considerably under 10 cwt., so that it does not err on the side of excessive weight. The engine works at a pressure of about 140 pounds, and a speed of 12 or 13 miles an hour, it is estimated, can easily be maintained. The driver has few complications to attend to; once a start is made, the machinery runs automatically, with none of the multitudinous handles and levers to be turned that are found on some motor-carriages. The one lever for turning on steam regulates the speed of the carriage to a nicety, and the steering-handle action on the fore-carriage and the foot-brake (which it is intended to supplement by a screw brake) acting on both driving wheels are the only things to claim his attention. A very clever arrangement permits of stoking from the top of the boiler case, without losing heat; in fact, all the details have been thought out with great ingenuity. The trial was only an initial one, but it showed enough to demonstrate that Newcastle has at last what promises to be a very efficient autocar, serviceable for both town and country use, for rough roads and smooth, for hilly districts as well as level. It would serve for purposes of pleasure as well as for commercial uses, and, what is of the greatest importance, is not apt to get out of order, while it is simplicity itself to manage. The inventors and makers are to be congratulated upon having been the pioneers on Tyneside in the manufacture of autocars, and upon having at their first attempt turned out so satisfactory a machine. It needs improvements in detail, but we feel sure it is all right in the main.—*The Automotor.*

"Engineer" 1,100 Guinea Competition.

On March 31, when the entries for the "Engineer" 1,100 guniea road carriage competition closed 71 had been enrolled. It has been decided not to publish the names of the entries, however, until the vehicles are delivered at the Crystal Palace, on or before May 24.

The terms of the competition and the different classes of vehicles eligible will be found on page 9 of the May, 1896, number of THE HORSELESS AGE.

Under Class A 25 entries have been made; under Class B, 21 entries; under Class C, 15 entries; under Class D, 2 entries, and in the Supplemental Class, 8.

Recent Motor and Gas Engine Patents.

577,589. *Valve for Explosive Engines.*—Ernest L. Lenbert, New Castle, Pa. Filed March 16, 1896. Serial No. 583,416.

577,716. *Motor Vehicle.*—Lewis Brown, Sawkill, N. Y. Filed Jan. 16, 1896. Serial No. 575,673.

577,536. *Oil Engine.*—Armand Peugeot, Valentigny, France Filed July 29, 1896. Serial No. 600,914. Patented in France Feb. 6, 1895, No. 244,925; and in England May 21, 1896, No. 11,078.

577,5(?)7. *Gas Engine.*—Luther H. Wattles, Providence, R. I., assignor by direct and mesne assignments of three-fourths to William B. Sherman, same place, and Byron C. Davis, Brooklyn, N. Y. Filed Dec. 7, 1895. Serial No. 571,337.

577,572. *Motor Vehicle.*—Eben D. Cross, Chicago, Ill., assignor of one-fourth to William P. Tuttle, same place. Filed July 25, 1895. Serial No. 557,071.

577,898. *Explosive Engine.*—Jesse Walrath, Racine, Wis. Filed Dec. 0, 1895. Serial No. 571,507.

578,034. *Vaporizer for Petroleum Engines.*—Oswald Bomborn, Magdeburg, Buckau, Germany. Filed May 23, 1896. Serial No. 592,733. Patented in Germany May 21, 1896. No. 87,462.

578,112. *Gas Engine.*—Lewis H. Nash, South Norwalk, Conn., assignor to the National Meter Co., New York, N. Y. Filed June 17, 1891. Serial No, 396,561.

578,266. *Oil, Gas or Like Engine.*—Walter Rowbotham, Birmingham, England. Filed April 30, 1896. Serial No. 589,776.

578,651. *Motor-Propelled Vehicle.*—Henry G. Morris and Pedro G. Salom, Philadelphia, Pa. Filed July 6, 1896. Serial No. 598,211.

578,683. *Vaporizer.*—George E. Tregurtha, Malden, Mass. Filed April 29, 1896. Serial No. 589,564.

578,329. *Propelling Device for Vehicles.*—Frank Gruber, Newark, N. J. Filed Feb. 29, 1896. Serial No. 581,323.

578,377. *Explosive Engine.*—Jesse Walrath, Racine, Wis. Filed Jan. 6, 1896. Serial No. 574,418.

578,551. *Vehicle Tire.*—Charles E. Duryea, Peoria, Ill., assignor to the Indiana Rubber and Insulated Wire Company, Marion Ind. Original application filed Dec. 28, 1891. Serial No. 416,308. Divided, and this application filed June 8, 1896. Serial No. 594,734.

579,554. *Gas Motor.*—Edward W. Blum, Cincinnati, O., assignor of one-half to John H. Strieker, Anderson, Ind. Filed Dec. 26, 1895. Serial No. 573,306.

579,068. *Hydro-carbon Engine.*—Edward Merry, Springfield, Mass., assignor of one-half to George D. Lytle, same place. Filed Feb. 8, 1896. Serial No. 578,454.

579,789. *Gas Engine.*—Peter T. Coffield, Dayton, O., assignor to W. P. Callahan & Co., same plate. Filed Nov. 16, 1896. Serial No. 612,210.

579,857. *Rotary Engine.*—Nicholas J. Verret and Thomas H. Mooney, Pine Bluff, Ark. Filed May 4, 1896. Serial No. 596,178.

579,860. *Gas Engine.*—Oliver Colborne, Chicago, Ill. Filed Dec. 23, 1895. Serial No. 573,040.

579,890. *Motor-Propelled Vehicle.*—Henry G. Morris and Pedro G. Salom, Philadelphia, Pa. Filed June 20, 1896. Serial No 596,343

579,921. *Igniting Apparatus for Internal Combustion Engines.*—George L. Woodsworth, Stanford, University, Cal. Filed May 12, 1896. Serial No. 591,313.

580,090. *Gas or Gasolene Engine.*—James G. Lewis, Baltimore, Md., assignor by direct and mesne assignments to the Lewis Gas Motor Company, of Baltimore, Md. Filed July 29, 1895. Serial No. 557,471.

580,172. *Gas or other Explosive Engine.*—Mildred Blakey, Pittsburg, Pa. Filed July 10, 1896. Serial No. 598,637.

580,301. *Motor.*—Andrew Wilson, Montreal, Canada, assignor of one-half to Thomas Hocking, same place. Filed June 20, 1896. Serial No. 596,320.

580,343. *Roller Bearing for Vehicles.*—Arthur W. Grant, Springfield, O., assignor to the Rubber Tire Wheel Company, same place. Filed Aug. 15, 1895. Serial No. 559,358.

580,387. *Explosive Engine*—George H. Ellis and John F. Steward, Chicago, Ill. Filed Dec. 26, 1895. Serial No. 573,312.

580,444. *Gas Engine.*—Hurburt C. Baker, Hartford, Conn. Filed July 9, 1895. Serial No. 598,579.

580,445. *Motor Engine.*—Francis G. Bates and Frank H. Bates, Philadelphia, Pa. Filed Dec. 15, 1896. Serial No. 615,762.

580,446. *Petroleum Engine.*—Dixon Best, Peterborough, Canada. Filed April 1, 1896. Serial No. 585,758.

580,838. *Rotary Engine.*—Thomas R. Almond, Dunwoodie Heights, N. Y. Filed Nov. 7, 1896. Serial No. 611,351.

581,184. *Device for Reversing Motion of Propeller Wheels, Etc.*—George E. Tregurtha, Malden, Mass. Filed April 29, 1898. Serial No. 589,565.

Automatic Cylinder Oil Cup.

An automatic cylinder oil cup, designed for gas engines, is now placed upon the market by Charles B. King, Detroit, Mich.

This cup requires no attention, and begins to feed oil when the engine is started and ceases to feed when the engine is stopped. It will be much appreciated in motor vehicles and yachts, where night runs are made, and also in all cases where the motor is in a dark and inaccessible place.

It is 2½ inches in diameter by 2¾ inches high and has no working parts to get out of order or become clogged with oil. Each cup is highly finished and weighs about one pound. They can be supplied in any quantity.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

A SUCCESSFUL INVENTOR AND DESIGNER of Gas, Gasolene and Kerosene Motors, for stationary and road purposes, desires a situation in which he can have a moderate salary and an interest in his inventions. Address "OHIO," care THE HORSELESS AGE.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

A Splendid Opportunity.

Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE, which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection with a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

WANTED CAPITAL—To build and patent a new power Transmission for Motor Wagons. Will be gladly used by all motor wagon builders on royalty; will give 40 per cent of patent. WESLEY KOUNS, Salina, Kans.

WANTED.—A low wheeled motor vehicle for a cripple. Address EDWIN COOMBS, Elmer, New Jersey.

WANTED.—Bright man, with small capital or credit, to take electric launch privileges, in connection with electric railway, in the most prosperous manufacturing community in America, on slackwater river; great chance for right man. Address "S," care THE HORSELESS AGE, New York.

PARTY WITH SMALL CAPITAL, OR MANUFACTURING concern, desirous of introducing its product, may learn of excellent opportunity to run horseless omnibus or wagonettes over short line, in community of nearly half a million and connecting prosperous electric railway routes. Address "J.," care THE HORSELESS AGE, New York.

FOR SALE.—Double Cylinder Gas Engine, 3½ actual horse-power; weight, 130 lbs., $130; a two horse-power single cylinder, $110; some experimental motors, $75 each; all guaranteed; enclose stamp for answer; photos, 10 cents each. A. D. STEALEY, 1480 23d Avenue, Oakland, Cal.

FOR SALE.

THE EINIG STEAM CARRIAGE, SHOWN ON page 19 of December issue of THE HORSELESS AGE, can be bought for half the cost to build. Address JOHN EINIG, P. O. Box 247, Jacksonville, Fla.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.

Price $3.00
Foreign 3.25

A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.

Price $1.00
Foreign countries 1.05

The Gas Engine. History and practical working. By Dugald Clerk. With 100 illustrations. New edition. 12mo., cloth.

Price $4.00
Foreign countries 4.25

Auto-Cars, Cars, Tramcars and Small Cars. By D. Farman. Translated from the French by L. Serraillier. Preface by Baron de L. de Nyevelt. 258 pages, 112 illustrations. 12mo., cloth.

Price $2.00

A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.

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Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.

Price $2.50
Foreign countries 2.75

IN PREPARATION.

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

I am a great admirer of your journal, and hope it may prosper and live long in the land. It is a step in the right direction, and is bringing out practical ideas that might never have been developed. JAMES B. BRAY.

WAVERLY, N. Y.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, APRIL, 1897. No. 6.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

PUBLICATION OFFICE:

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ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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THE HORSELESS AGE, 216-218 William Street, New York.

Entered at the New York Post Office as second-class matter.

The Perfect Explosive Mixture.

THE extract published in this issue, from a German technical paper, referring to the experiments of Herr Petréano to obtain an instantaneous explosion in a gas engine, is most interesting. It proves that the attention now being given to the explosive engine all over the world is bearing good fruit, and that the all-important subject of the combustion of gases is approaching a satisfactory settlement. Herein lies the success of the gas engine. A perfect explosive mixture, such as it appears Herr Petréano has obtained, eliminates at once many of the difficulties encountered hitherto. Even the circulating water in the jacket is said to have been dispensed with and an entirely odorless exhaust secured. A reliable ignition is certainly as necessary as the perfect explosive mixture, but the mixture comes first in order.

Another Newspaper Yarn.

THE Grant Bramble epidemic is spreading. A New York daily recently published a ridiculous story, in which the names of Thomas A. Edison and the General Electric Company figured, and the statement was made that the latter were preparing to flood the market with motor carriages at $100 apiece. Mr. Edison himself was represented as indulging in a great deal of loose and extravagant talk about motors and motor vehicles, but the most preposterous part of it is that in which the Wizard is credited with saying that "a serviceable, light vehicle to carry two or even four persons can be made at a cost of from $100 to $125."

Whether Mr. Edison ever said anything of the kind or whether his words have been garbled we do not know, but we do know that the statement is not true, and the pity is that newspapers of large circulation disseminate among the masses so much nonsense about mechanical and commercial matters.

The incident would be unworthy of notice were it not that it affords another opportunity for reenforcing this unfortunate truth.

The Providence Race.

THE announcement of another race to be run this Fall at Narragansett Park, Providence, will hardly be received with much enthusiasm after the experience of last year. It will be remembered that no suitable provision was made for the reception of the vehicles, and that both contestants and visitors were put to great discomfort because of this omission. The amount distributed in prizes was also considerably cut down through the application of the "rules of horse racing," rules which had not been mentioned in the published statements of the management. In view of these facts it would be wise for those who contemplate engaging in this

contest to insist upon a more definite understanding than was had last year.

Iron Versus Rubber Tires.

ONE of our correspondents makes a comparison between iron and rubber tires for motor carriages and decides in favor of the former on the ground of their greater durability and cheapness.

The tire question is a very broad one as related to motor carriages, and our correspondent evidently fails to comprehend its full scope. The durability of the tire is not the only point to be considered. The durability of the vehicle is even more important, and no one will contend for a moment that the life of a vehicle is not prolonged by the use of rubber tires. If this is true of an ordinary horse vehicle, how much more so of a motor carriage which contains machinery in constant operation, and should, therefore, be relieved of shock and vibration to the fullest extent of modern science. In this aspect of the case the rubber tire becomes an absolute necessity for a motor carriage, and any one who adopts the iron tire instead must soon be convinced of his short-sightedness by the more rapid deterioration of the vehicle. Comfort, of course, is another strong point in favor of the rubber tire, and, so far as cost is concerned, it is sufficient to say that we do not look at first cost but at final results.

A Semi-Traction Gasolene Engine.

THE illustration represents a novelty in traction engines, being a gasolene semi-traction engine, which was last month shipped to Yucatan, for running a stone crusher, and for use upon a tramway several miles long, upon which, however, it will be self-propelling in one direction only, having a tongue and attachments for hauling by team. It was built by the Charter Gas Engine Company, of Sterling, Ill. It has flanged wheels for use on the track, but the flanges are so low that they do not cut in very much when used on the road. The propulsion of the engine in one direction by its own power is effected through the sprocket chain connection of the main shaft with a sprocket wheel on one of the axles, as shown in the illustration. This engine has the general features of the Charter gasolene engine, which has been many years on the market, the use of gasolene direct from the tank being so controlled as to secure perfect immunity from danger of fire and explosion, while unaffected by changes of weather and temperature. The driving pulley is a friction clutch pulley, simple in construction, and with means for taking up the wear of the clutch shoes, which are lined with hard wood. The machine that is being operated can be stopped and started at will, while the engine continues to run. Mufflers for the exhaust reduce the noise, so there is not as much as is made by the steam engine exhaust. The gasolene tank has capacity for over a day's consumption, and is shown in the cut.—*Scientific American.*

R. L. Morgan Motor Carriage.

Ralph L. Morgan, connected with the Morgan Construction Co., Worcester, Mass , is the inventor of a motor carriage, just completed and herewith illustrated.

All the wheels have ball bearings, thirty half-inch balls being used in each wheel, and 2¼-inch Hartford pneumatics attached to very stiff steel rims of the same make. The spokes, 42 in each wheel, are ⅛ inch in diameter. The bearings are claimed to be absolutely dirt proof.

The rear axle which is in one piece is provided with clutches to regulate the wheels in turning corners. The front axle, a steel forging in one piece without a weld, is pivoted at the wheels, steering being effected by means of a series of levers and bell cranks. It is 1⅛ inch square.

The frame is made of 1⅛ inch 18 gauge carbon steel tubing, and is of the well-known truss design. On this frame rests the motor, speeding gear, oil and water tanks. This construction the inventor considers of great advantage for the following reasons:

First: The weight of the carriage is brought low down, thus preventing tipping over.

Second: Vibration of the motor is not transmitted to the rider, easy springs being interposed between the frame and body.

Third: Motor and tanks are exposed to the air, thus tending to some extent to keep them cool.

Fourth: Every part of the machinery is easy of access.

Fifth: Only four nuts need be unscrewed and then the body may be lifted entirely free from the frame, all of which can be done in five minutes. This operation is not necessary for ordinary cleaning up, but only when it is desired to remove part of the motor, etc.

The motor, a five actual horse-power, is of special design for the place, having been made as light as good judgment would allow. It is of the vertical type, single cylinder, and runs at 400 revolutions.

The speed changing device is also of unique design, as there are no gears to come out of mesh, and therefore no teeth are broken. The power is transmitted from the countershaft to the rear axle by sprocket and chain, the sprockets being five to one. The chain which is extra heavy and of special design, was made by the Boston Gear Works.

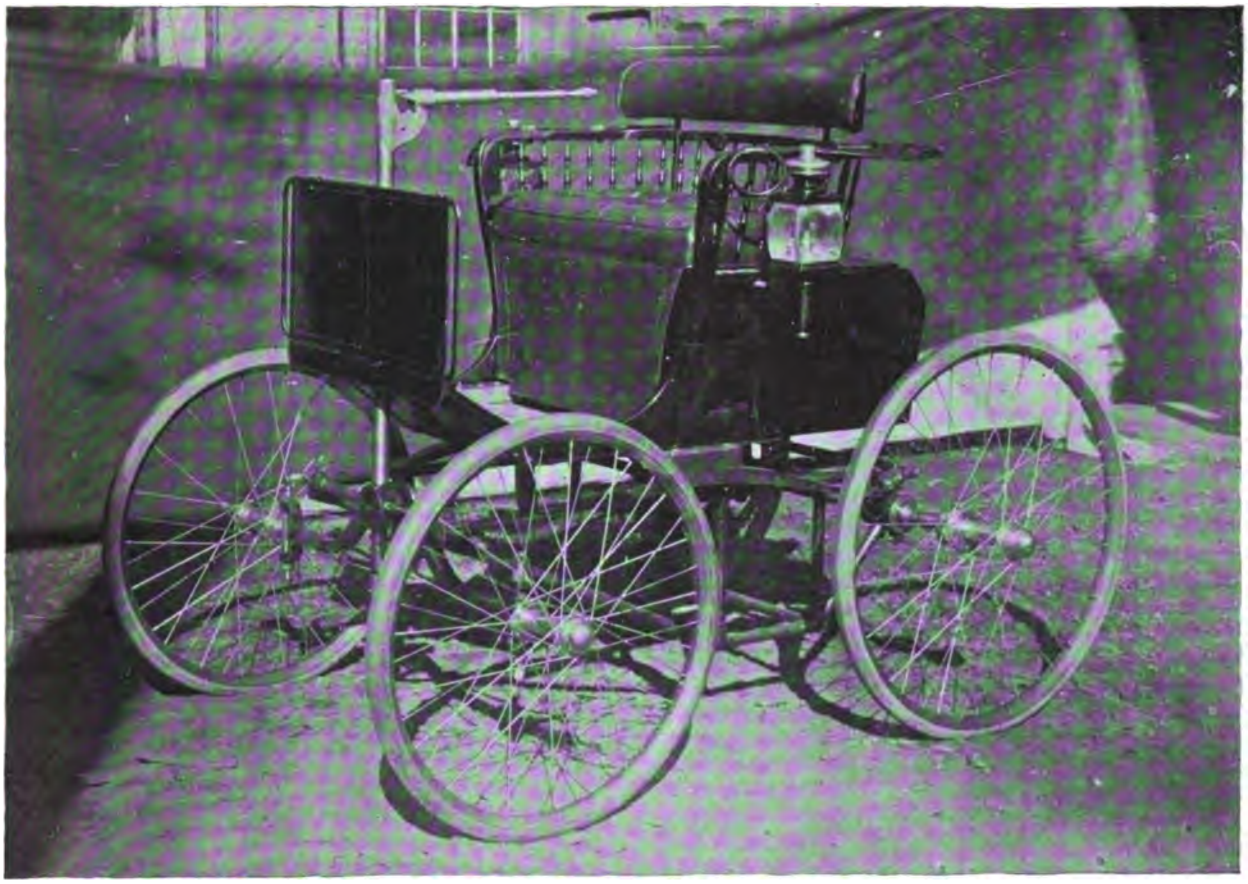
The speeds are three, two ahead at ten and twenty miles per hour, and one backward at three miles.

The galolene tank holds five gallons, which is enough for a ten-hour run at full power all the time.

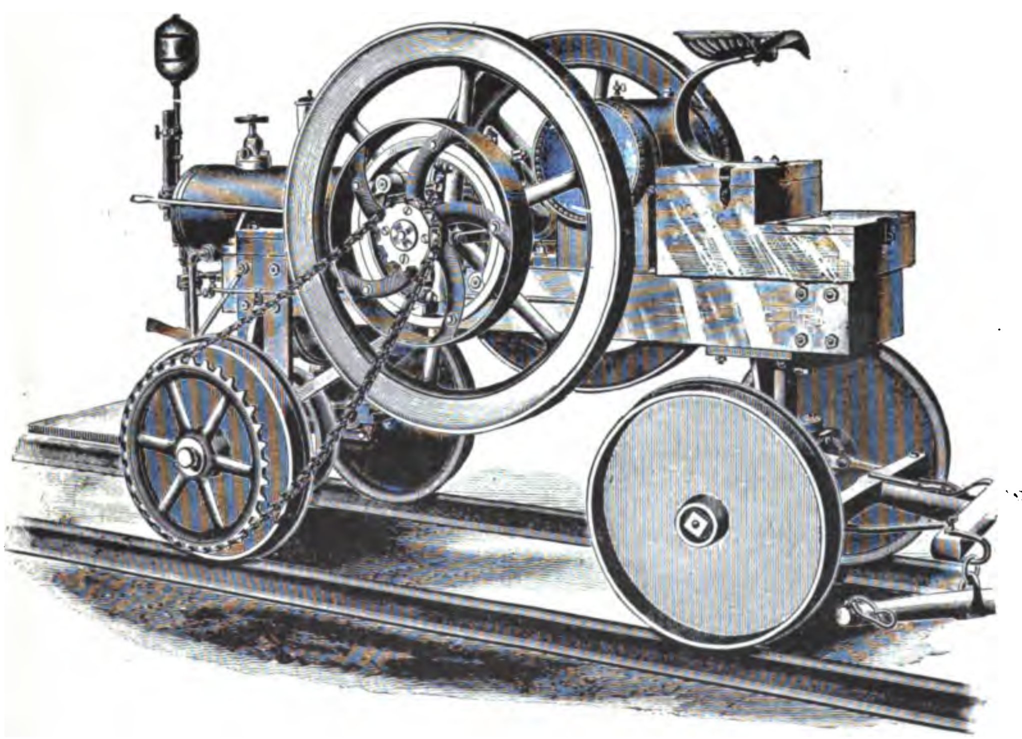
The water tank holds enough to keep the cylinder cool at all times, the size having been arrived at only after a number of experiments.

The control of the carriage is effected in the following manner. The driver has both hands in use, the right to steer with, the other to control the forward or backward movement, the speed changing, stopping and starting device. A generous band brake is provided which is worked by the foot and is capable of stalling the motor when developing full power. Therefore, if the motor gets beyond control, all the operator has to do is to put his foot to the brake and stop the unruly servant.

The weight of the carriage is 750 pounds all told.



R. L. MORGAN MOTOR CARRIAGE.



SEMI-TRACTION GASOLENE ENGINE.—CHARTER GAS ENGINE CO., STERLING, ILL.

THE COLUMBIA MOTOR CARRIAGE.

Thursday, May 13, was a memorable day in the history of the motor vehicle in America. On that day the Pope Manufacturing Company, Hartford, Conn., made their opening bow to the world (the Pope Company never bows to anything less) as manufacturers of motor carriages. After two and a half years of patient experimenting this leading company in the science of trackless locomotion has satisfied itself that it has a commercial carriage, and the event was therefore doubly significant. First, because the Pope Manufacturing Company is the first company to hold any such public opening, and, second, because the Pope Manufacturing Company is of national importance.

Invitations had been sent out to journalists and others interested, and notwithstanding the inclement weather a large number of visitors were in attendance. An ample collation was served all day in the offices, and visitors were taken to ride in the new carriages, of which quite a number were seen to be ready for the road. Most of the guests were requested to try the management of the vehicles themselves, to demonstrate the ease of control. Many were eager to embrace the opportunity and did so to their entire satisfaction.

The Pope Manufacturing Company began its work in the motor carriage field in January, 1895, and during the two years and a quarter that have elapsed since that date investigation and experiments have been going on, without regard to expense, to determine what is the best type of carriage and to devise and construct a vehicle which could be most successfully put before the public at the present time. Attention was first directed to the gasolene carriage, but after a very careful examination of this method of propulsion it was decided not to build a carriage with a gasolene motor, but to adopt the storage battery, and an arrangement was entered into with the Electric Storage Battery Company, of Philadelphia, whereby the Pope Company is able to use the chloride accumulators. Still the effort to discover a method of propulsion independent of a base of supplies has not been abandoned.

In regard to the electrical equipment of its new carriages the Pope Company says:

"It has been selected with a view to convenience in charging from the ordinary type of electric-light station circuits common to all towns of any size, to factories and private plants generally, and no doubt the situation will be understood by the initiated when it is reported that the carriage is susceptible of being charged from any direct current of between 110 and 120 volts. This meets the most prevalent conditions as regards city and suburban service. As an indication of the extent to which the convenience of the purchaser has been considered, it is interesting to note that where the batteries are fully charged the current is automatically cut out. In large cities this current is obtainable at a rate which amounts to about 1¼ cents per mile of smooth, level road, and the cost of operating may be said to vary according to conditions from this point to less than ½ cent per mile in case the current is obtained from the owner's private electric plant. It will be seen from this that upon a probable average run of 20 miles a day, the expense of operation of these carriages would vary according to the conditions above cited, from 10 cents to 25 cents a day. The difference between the annual expenditure on this basis, and the cost of keeping the two horses which would be necessary to maintain the same service, certainly represents the interest on many times a greater sum than the difference between $3,000, the price of each of these carriages, and the cost of any carriage which could take its place, or, for that matter, of the entire price."

"The very first question that anybody will ask in regard to an electrical carriage, of course, is, How far will it go? The radius of action of the Pope company's carriages is over 30 miles—probably 35 miles. It has a maximum speed of 15 miles an hour, and other speeds on smooth level roads are provided for as follows: First, three miles an hour; second, speed six miles an hour; third, speed 12 miles an hour."

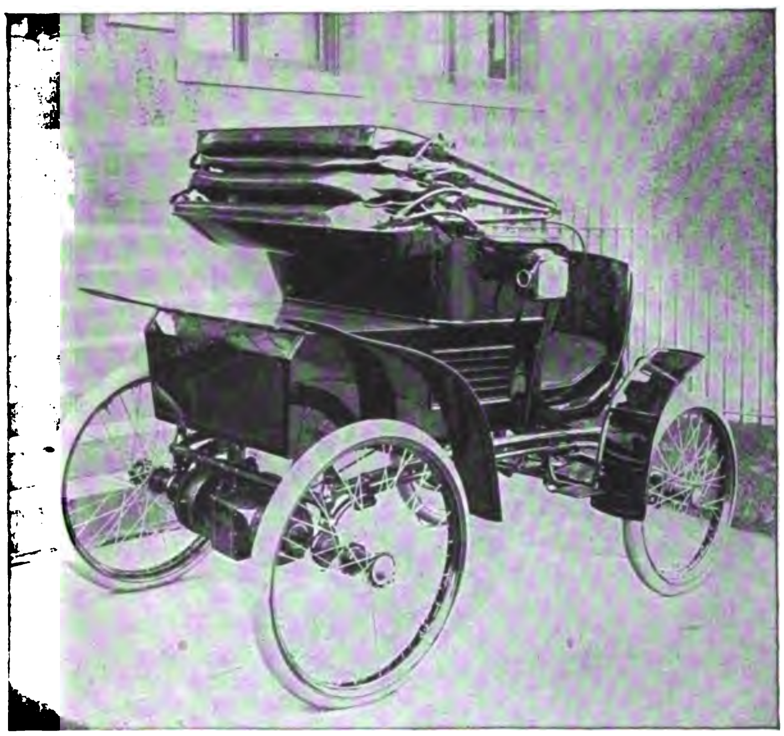
The object of the company has been to provide a vehicle which would be able to cover the distances required of the ordinary city horse. In order to determine this the company set on foot an investigation in which with the aid of cyclometers attached to the vehicles used by the various physicians, private citizens, grocers and expressmen it was determined that the average range of vehicles even used as much as those enumerated was about 18 miles a day, and in but one case (that of a veterinary surgeon with a large country practice) did the daily mileage exceed 25.

The primary consideration in the design has not been speed, but to make the carriage susceptible of operation with the least possible care and trouble, and with the least possible knowledge or instruction on the part of the operator. In other words, to quote one of the company's watchwords, the object has been to provide a motor carriage which should be "fool proof."

Each completed carriage is subjected to a test for endurance so severe that its successful result may be fairly taken as a proof of the wisdom of the adopted design and the success of the construction. In the course of this test, during which, at one time or another, the carriage is subjected to almost every condition likely to arise in service, the carriage is driven at full speed over an aggravated form of corduroy road. Whether or not this test has had an undue effect upon the structure and mechanism of the carriage is determined by careful measurements with a theodolite before and after the test. But before the carriage leaves the shops at all it is subjected to a variety of running tests in which it encounters every sort of obstacle that it could meet in actual use, and is subjected to strains which should certainly reveal any weakness of the structure.

The carriages are entirely available in the most severe weather, and while their radius of action is, of course, necessarily reduced, six or eight inches of heavy snow is no obvious obstacle, and the same is proved by thorough tests to be true of mud. The experimental carriage also exhibited to visitors, has now made a record of about 3,500 miles, and has never sustained an accident so severe as to prevent its return with its own power. The endurance of the batteries was well demonstrated by this experience, and although they were carefully examined a few days ago they show no signs of deterioration.

Comparative lightness with great strength are the striking characteristics of the Pope vehicle. The steel frame upon which the body of the carriage rests is made of the Pope Tube Company's well-known .50 carbon steel and selected in dimensions that enable it to be used in the annealed state. As a result a better alignment of bearings can be insured. Everything about the carriage is made on a bicycle basis and ball bearings are freely used throughout. The peculiar design of the wheels was selected as a result of the observation of the Pope Company's representatives of the performance of the wheels of the carriages in all the important races that have



COLUMBIA MOTOR CARRIAGE, POPE MFG. CO., HARTFORD, CONN.

taken place to date, both here and abroad. They are equipped with the three-inch Hartford single tube pneumatic tires, whose performance on the experimental carriage has been most satisfactory, although the first set of tires had suffered no deterioration. A change of wheel diameter after a mileage of 1,200 compelled the substitution of a new set, which upon a mileage of about 2,300 appear to be unaffected by the severe service they have been compelled to undergo.

In design the vehicle is a high-backed phaeton, the front axletree of which is pinioned at the centre under the frame of the carriage so as to be readily turned by means of the steering handle which rises at the front of the seat. The person operating the carriage occupies the seat on the left-hand side. He steers the carriage with his right hand and regulates the speed by means of an upright lever which rises at his left · With this lever the current can be turned on and off and the carriage made to move backward or forward. The lever extends to a mechanism under the seat which cuts the cells of the electric battery in or out. It is very similar to the mechanism for increasing or diminishing the current on a trolley car. Beside this operating mechanism stands a meter about a foot in height, with an upper face, on which a needle indicates the exact amount of electric power remaining in the cells. Alongside the meter are four small switches controlling the four electric lamps with which the carriage illuminates its way at night. The powerful brake which is applied to the rear axle-tree by means of the round gearing box is operated by a foot lever rising through the floor of the carriage. Still another feature is a small musical gong on the dasher, operated by means of a bellows which the driver strikes with his heel at the proper moment. One of the features of this carrirge is the balance gear, which enables the two rear-wheels to revolve independently of each other while turning a curve. The axle is divided into two sections, which may operate independently while the brake pressure is applied to both.

The circular gearing box and the diminutive motor box at the right of it are not large enough to disfigure the carriage. The motor which operates the axle directly is a 2 hp Eddy motor, which in order to develop a speed of 12½ miles an hour on a smooth road consumes 18 amperes of current with a voltage of 80. This requires an output from the batteries of 1.93 horse-power. The efficiency of the motors is 80 per cent. and it is assumed that the loss in the gearing of the carriage is 10 per cent., making the total efficiency of the motor mechanism 70 per cent. This means that with 1.93 horse-power going in from the batteries, 1.35 horse-power, practically 1⅓ horse-power, is being exerted at the rim of the wheel. The motors are built for a normal load of 2 horse-power, being 1½ kilowatts. Their specifications called, however, for them to stand an overload of 100 per cent., or 4 horse-power for one-half hour without injurious heating. The capacity of the batteries is stated as 70 ampere hours at a discharge rate of 25 amperes. This would mean that 25 amperes discharge could be maintained for 2.3 hours, which on ordinary roads could be expected to propel the carriage between 30 and 35 miles, according to the number of stops made and the conditions of the grading of the road.

No rheostat is required for the operation of the carriage. The motor is series wound, and the highest speed is produced by putting the storage cells and motor field in multiple. The batteries are formed in four units of 11 cells each. These are 12 inches in length by 1½ inch interior width, so that the 11 combined cells fill a box about 1 by 2 feet. These four boxes are slid into the battery chamber, from the rear, and each one weighs a little over 200 pounds, so that two men are required to lift them into place. The total weight of the four is placed at about 850 pounds.

The total weight of the carriage is about 1,900 pounds.

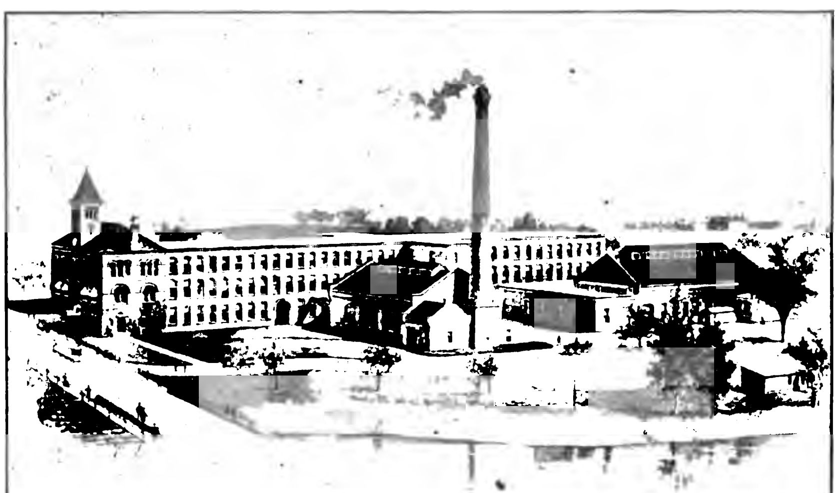
All battery connection, and all connections throughout the carriage which have to manipulated in any way are made of two different sized holes, the positive holes being the larger. Hence no negative plug can be inserted in a positive hole and *vice versa.*

When leaving the carriage standing in the street one can, by taking out the emergency plug, which is of a size to conveniently go into the waistcoat pocket, make it impossible for any one not possessing a similar plug to use the carriage. The connection is broken by removing this plug, so that the carriage cannot again be moved by its own power until the plug is replaced.

The purchaser of a carriage is furnished a diagram giving the names of its different parts and a brief statement of such few precautions as are necessary in its care and operation. A few wrenches and tools also go with each vehicle.

From a circular issued by the company we quote the following passage in regard to the sensations of riding in the new vehicle:

"The experience of coasting down a long, steep grade, with the consciousness that the pleasure is not restricted to season or locality, is certainly not approachable by any other means we have at hand at present. It without doubt is the direct precursor to actual flying in the air. It is nearest approached, probably, by the bicycle, but in this case the rider has not the comfortable surroundings and the freedom from care that exist in the case of the motor carriage. The speed also is a feature from which is derived a new pleasure. Nothing, even in the imagination, can exceed the delightful sensation of running along on a



MOTOR CARRIAGE DEPARTMENT OF POPE MANUFACTURING CO.

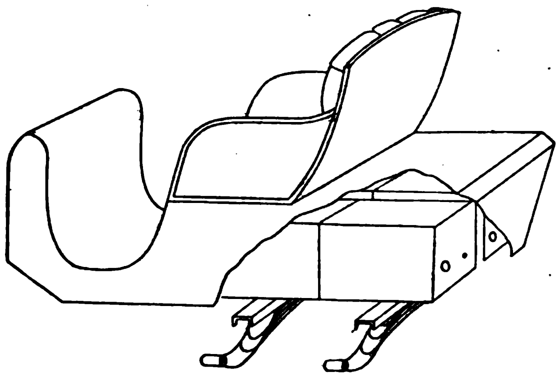


FIG. 1.

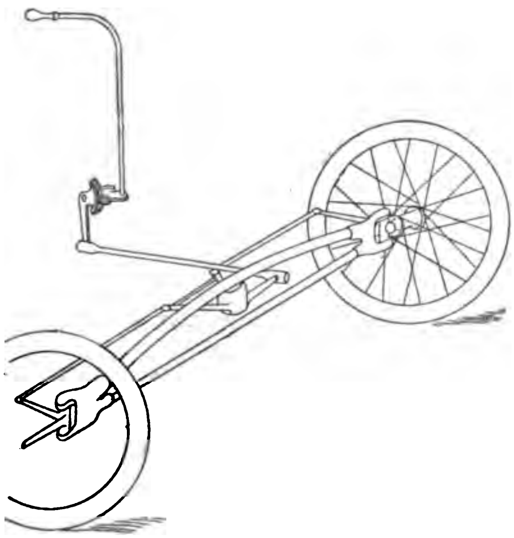


FIG. 2.

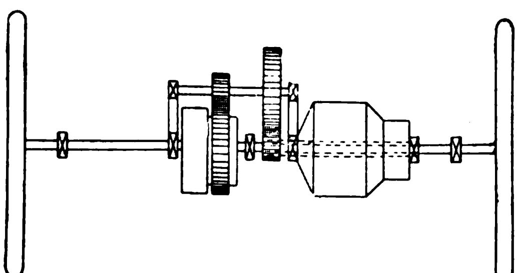


FIG. 3

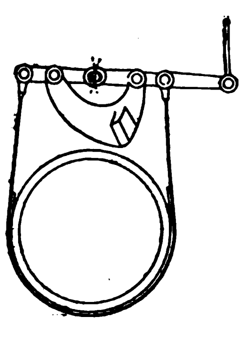


FIG. 4.

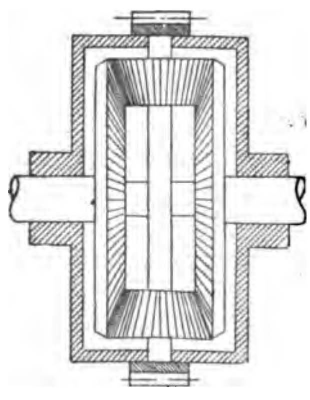


FIG. 5.

smooth roadway in a luxuriantly upholstered vehicle, having large pneumatic tires, at a speed of 15 miles an hour. Horses considered to be trotting at a very fair gait are overtaken and passed as though they were merely walking. Coupled with it all is a sense of security on account of the rigid construction of the carriage, which is not a little enhanced by an observation of the severe tests already alluded to, and which the carriage is obliged to undergo before shipment."

In the detail illustrations Fig. 1 shows the method of supporting the batteries; Fig. 2 the steering mechanism; Fig. 3 the rear axle, with motor and driving gear; Figs. 4 and 5 the foot-band brake and balance gear respectively.

The editor of the Horseless Age was given a special demonstration of the staunchness and control of the vehicle. In the rear of the factory yard is an oval turnway of small radius. Mr. Maxim backed the vehicle around this narrow track sevseveral times at a speed of 12 miles an hour, proving to the satisfaction of the editor that the steering and general build of the vehicle were thoroughly reliable. The road selected for the exhibition of the carriages offered about all of the conditions that would be met with in actual service. Mud, sharp turns, trolley cars, tracks, hills, water and other inconveniences were encountered, yet no difficulty was experienced over any part of the route.

The Pope Company have for some time past been fitting up a large factory specially for the manufacture of these carriages. The building, which is illustrated on another page, is at the corner of Park and Laurel Streets, and is of the same solid construction as all the other factories of the company; is large enough to afford room for the rapid growth which is confidently expected in this new department. One hundred carriages are at present in course of construction, and this output will be increased as fast as the necessary facilities can be provided.

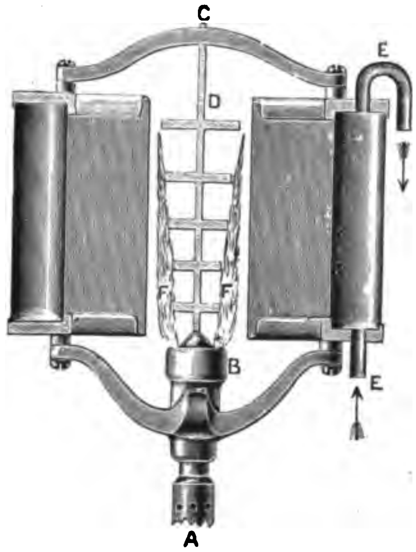
The motor carriage department of the Pope Manufacturing Company bids fair to rival in reputation and extent the older bicycle manufactory, which was first and always has been foremost in the field.

The Cox Generator in Gas Engine Ignition.

Gas engine and motor builders are much interested in a new device known as the Cox generator, which produces electricity direct from heat, and is believed to be an ideal source of the electric spark. It is the invention of H. Barringer Cox, and is manufactured by the Cox Thermoelectric Co., Ltd., 4 Victoria Mansions, Westminster, S. W., England. In applying this device to the gas engine it has been found most convenient to attach it to the exhaust pipe, using the flame of a lamp to produce the necessary degree of heat for starting. As soon as the engine is in operation the flame of the exhaust furnishes ample heat to generate the electric current. The machine which is used for ordinary purposes, weighs about eight pounds, is seven inches in diameter and five inches high, and generates five volts and five amperes.

What is termed the active element or the part which converts heat into electrical energy is built up of rows of mechanically cast couples, joined together in series to produce the desired voltage. This element is carefully tested throughout its entire process of manufacture to find whether there has been any change in the internal resistance during the varying

courses of baking. The entire active element is completely enclosed in cement, and the entire mass vitrified by baking. In the interior of the machine is what is termed a deflector, which evenly distributes the heat to all parts of the machine.

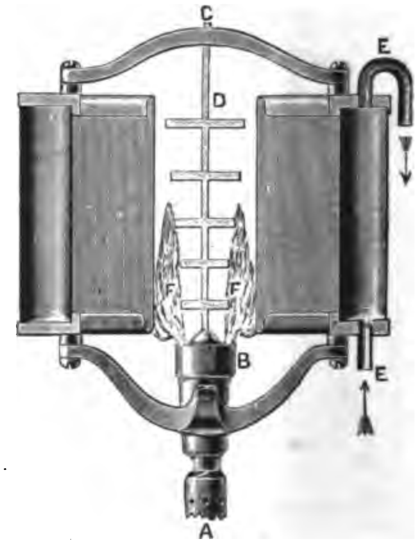


The machine is surrounded by a water jacket to prevent disintegration of the element. The machines can be coupled to produce any desired E. M. F. or for any ampere output. There is nothing to get out of order, no renewal of parts, the only thing consumed being the gas.

If by any chance the machine is short circuited no injury is done, as the electric action ceases in the element.

The consumption of gas is only 2½ feet a month and the amount of water required for the jacket is said to be about four gallons in six months.

The manufacturers claim that these machines are practically



indestructible if properly used, as after six years of testing they have found no deterioration.

The Cox generators are now used in various parts of Europe and the colonies for the manifold purposes to which a light power of this kind may be put, and the company has opened an office at 126 Liberty Street, New York, with the object of introducing the machines in America.

1½ H.-P. VEHICLE MOTOR.

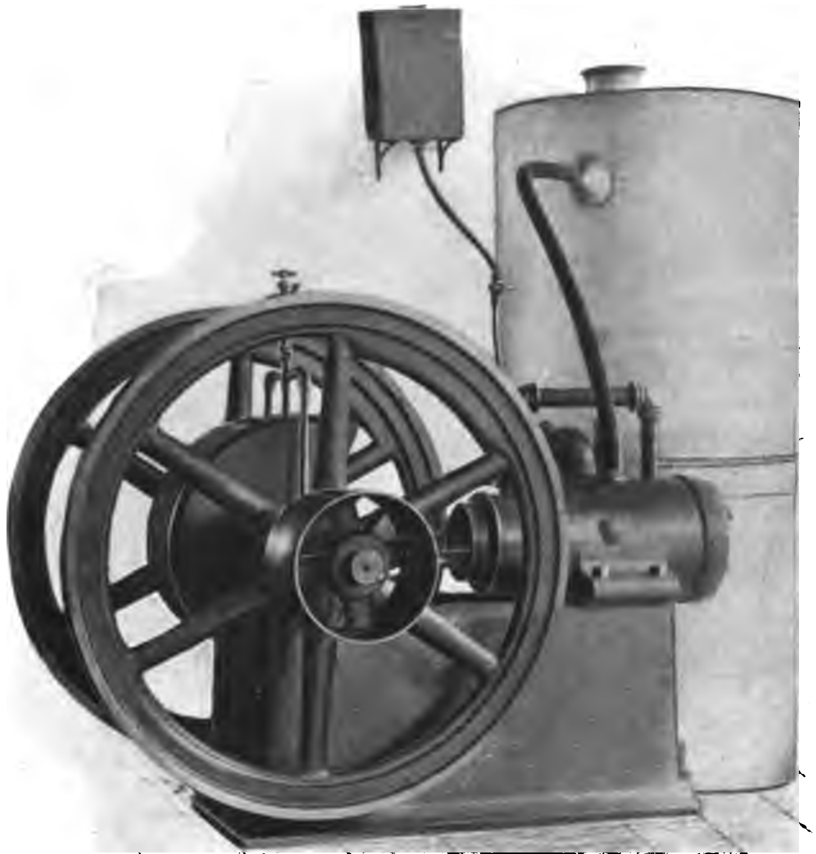
New and Novel Carriage Forthcoming.

The American Motor Company, Havemeyer Building, New York, have issued a new catalogue illustrating and describing the various styles of marine, stationary and vehicle motors which they are now manufacturing. These number 15 in all, ranging from 1 horse-power to 50 horse-power. In addition they are also prepared to execute special orders for sizes and styles not included in the catalogue.

The portions relating to motor vehicles are of special interest, as the announcement is made that an improved design of motor carriage is soon to be shown by this company, a carriage in which "an infinite number of speeds, from zero to maximum," may be obtained without changing the speed of the motor, the driving mechanism to employ neither pulleys, gears, sprockets, chains nor friction discs.

We illustrate their latest style of vehicle motors, marine and stationary.

2 H.-P. VEHICLE MOTOR.



HORIZONTAL STATIONARY MOTOR.—AM. MOTOR CO., N. Y.

YACHT TENDER.—AM. MOTOR CO., N. Y.

COMMUNICATIONS.

More About Iron Tires.

Editor Horseless Age.

My article on vehicles for cripples and iron tires in the February number of THE HORSLESS AGE has caused a few manufacturers of horseless carriages and would-be inventors to write to me, but no one has replied through THE HORSELESS AGE. For the benefit of the would-be inventors I will say that I have no money to experiment with. If I had I would go into the business myself, as I think such a tricycle, carriage, vehicle or whatever it was would be salable.

Some makers of rubber tires seem to think that what I said about iron tires will interfere with their business. Common sense will teach any reasonable person that iron tires will outlast rubber tires. I admit that some liverymen have carriages with rubber tires which are preferred by some of their customers, because they are noiseless and elastic, but they will not last so long or endure the rough usage. Tacks, glass, pieces of tin and iron soon destroy them, while they make but little impression on iron.

Iron tires on motor carriages would not make any more noise than on those drawn by horses. Neither do rubber tires eliminate the noise made by the horses' feet. To eliminate that we would have to have rubber shoes for the horses, which would be very expensive.

A wheel with a felloe like a lawn mower would not slip or clog, and attached to a moter carriage would be as serviceable as a rubber tire and far more permanent. There would be no puncturing, collapsing or coming off, and it would need no inflating.

I saw a horse rake, a few days ago, with iron wheels, which I think could be made to illustrate my theory. The felloe had a groove in it 1 inch wide and ¼ of an inch deep. The spokes were iron screw bolts, the head outside the felloe, fitting in the groove, and the thread entering a flange in the hub and holding it in place by the nut. Tires made in sections, 1 or 2 feet long and crimped, could be made to fit in the groove and held to the felloe by the spoke. Then, if a section of the tire broke or wore smooth, a new one could be replaced with no other tool than a wrench. EDWIN COOMBS.

ELMER, N. J.

About Rotary Engines.

Editor Horseless Age.

DEAR SIR: In the March issue of your paper, second page, you state that the rotary motor thus far is quite unsolvable. I beg to call your attention to the fact that some of the most powerful fire engines built in the United States use rotary motors to operate their pumps. The best engine we have in our department here in Quincy is so equipped. This engine throws an inch stream into the fourth story of the ordinary building in this town and is capable of throwing a stream nearly the whole length of a square.

It would seem from this, which will stand verifying, that there are rotary engines which will generate power enough to *propel a baby carriage*, as you are pleased to put it.

Kindly look into this matter a little more and let us read the results of your investigation in THE HORSELESS AGE. I expect to have my second rotary moving a light trap within two months and any information concerning rotaries is eagerly looked for, by Yours truly, H. E. FERRER.

QUINCY, ILL., May 8, 1897.

Improvements in Gas Engines.

At a recent meeting of the society of German engineers, Herr Petréano gave an account of his improvements in gas engines, by means of which a practically instantaneous explosion is obtained. An illustrated report is given in the *Zeitschrift des Vereines Deutscher Ingenieure* (Feb. 6), from which the following is abstracted:

It has been demonstrated experimentally that the explosion in gas engines of the Otto type is not instantaneous, but continues during the greater portion of the stroke, and that, in fact, unburned gas is discharged with the exhaust. This results in a reduced initial pressure and consequent reduced efficiency, as well as an unnecessary heating of the cylinder, requiring excessive cooling. The co-efficients of diffusion of various gases have been determined by Guglielmo, Obermayer, Stefan, Loschmidt and Waiz, and their results confirmed by Herr Petréano's own experiments, and these show, for example, that 1 liter of marsh gas requires 6 seconds to become fully diffused in 1 liter of air, and that 1 liter of gas compressed with 5 liters of air requires 10 to 12 seconds for diffusion. When therefore, the time of a single revolution of a gas engine is considered, it will be seen that the mixture cannot become sufficiently intimate to permit proper instantaneous explosion.

The apparatus of Herr Petréano provides for the mixture of the air and gas before they enter the cylinder, and consists of a cylindrical chamber through which passes longitudinally a central tube; through this tube the exhaust gases pass, thus heating it to a high temperature. The tube is covered with a wicking of asbestos fiber, and a series of diaphragms are fitted in the annular space between the outside of the central tube and the inside of the chamber. The incoming gas and air pass through this mixing and heating chamber, and are thus thoroughly diffused before they enter the cylinder for compression, and the result, as shown by indicator diagrams, is a greatly-increased rapidity of combustion, and an increase, not only in the initial, but also in the mean effective, pressure.

According to experiments made at the Technical High School at Charlottenburg, it is also possible to avoid altogether the use of circulating water in the jacket, it being only necessary to keep the jacket filled with water, and supply the loss by evaporation. After a ten hours' run under these conditions, the cylinder remained clean, the temperature of the water in the jacket not having exceeded 80° C. (176° Fahr.) The pressure shown by indicator cards for the explosion with the usual construction is only about 2.7 times the pressure of compression, while with the new arrangement the pressure of explosion is shown to be 3.7 times the pressure of compression.—*Engineering Magazine.*

WHITNEY FULL AUTOMATIC STEAM WAGON.

GASOLENE CARRIAGE. W. L. ELLIOTT, OAKLAND, CAL.

Death of M. Levassor.

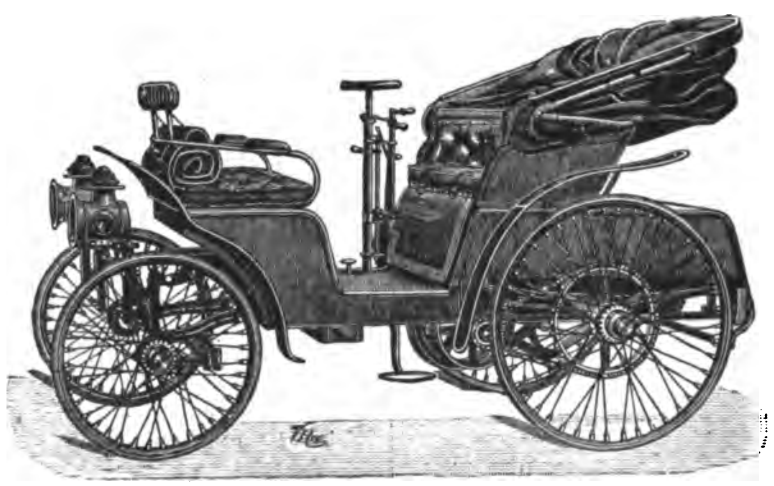
Emile Constant Levassor, aged 54 years, of the firm of Panhard & Levassor, 19 Avenue d'Ivry, Paris, France, the pioneer firm of motor carriage builders in that country, died suddenly at his home, near the factory, on April 23d, of an affection of the brain or the heart, believed to be the result of the serious accident which befell him last Fall in the Paris-Marseilles-Paris race.

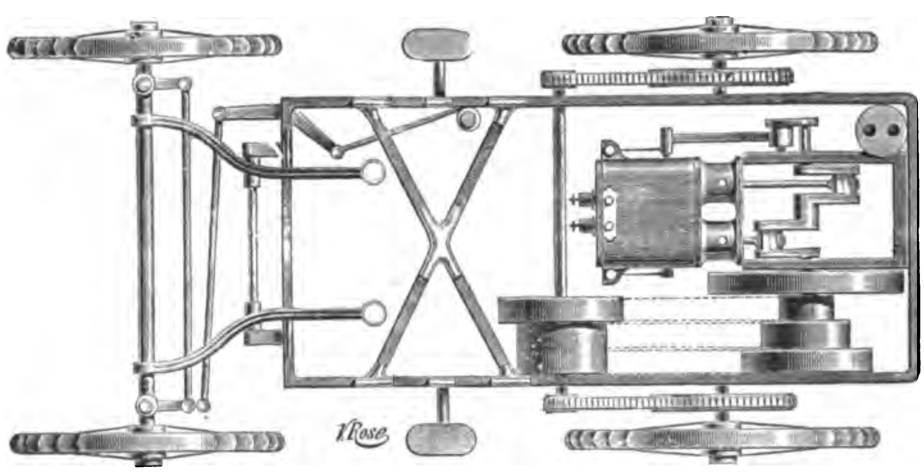
M. Levassor was a highly educated engineer who had served well his profession in mining and other enterprises, and who in 1872 joined the firm of Perrin & Panhard, then makers of wood-working machinery. About 1888 he began to turn his attention to petroleum motors for carriage propulsion, and a little later took up the Daimler motor as the most feasible for this purpose of any on the market. In adapting the Daimler motor to vehicles M. Levassor made a number of improvements in the motor itself, and in transmission devices, finally reaching the elegant model which won the Paris-Marseilles-Paris race, and employed an improved motor termed the "Phœnix," recently described in THE HORSELESS AGE.

In the organization of the Automobile Club and the races held under its auspices, M. Levassor took a very prominent part, winning the respect of all his associates by his modesty, integrity and indefatigable devotion to the cause of automobilism.

It will be recollected that in the Paris Bordeaux-Paris race he conducted his own vehicle from start to finish, a feat of endurance which caused much comment at the time. The injuries he sustained during the Paris-Marseilles-Paris contest, and which are believed to have contributed to his sudden ending, were due to the overturning of the vehicle he was conducting.

The funeral was attended by many members of the Automobile Club, who will greatly miss his personality and his efficient co-operation in all the club's undertakings.





NEW MODEL VALLEE MOTOR CARRIAGE.

The Clement Motor Carriage.

Light vehicles for one or two persons are coming more and more into fashion in France, says *La Locomotion Automobile.* This is easily explained by the fact that they are easily managed, and can be used either for short runs or for longer trips, both in the city and in the country. One of the best known of these is the Clement motor carriage for two persons, propelled by a horizontal, two-cylinder petroleum motor, known as the Clement-Michaux, placed in the forward part of the vehicle on a frame of steel tubes.

The motor (Fig. 1) is cooled by radiating ribs *A*. Each cylinder has an explosion chamber *B*, and a valve chest *C*, containing the automatic admission valve *E* and the escape valve *D*, operated by a cam and a lever. The hot tube at *F* is of the ordinary construction.

In the cylinder *A*, operates the piston *P*, connected by means of the connecting rod *J* to the fly-wheel *V*, revolving on the shaft *I*.

By means of gears *L*, *L'*, *L''*, in a ratio of one to two, this acts upon the cam shaft *M*, which also turns half as fast as the shaft *I*. The cams *N* and *N'*, arranged at 180° alternately act upon the friction roller *R*, and drive back the lever *Q*, which pivoted at *S*, commands the valve *D*. The cylinders are therefore of the Otto type.

At *T* is the frame carrying all the transmission mechanism, *V* contains the oil for the lubrication of the cams and the rollers *R*. The gears *L*, connecting rods and fly wheel also turn in oil, which is distributed through tubes 1, 2 and 3. *H* is the carbureter, which delivers at each admission through an automatic valve a fixed quantity of petroleum, which volatilizes as it is mixed with the air previously heated by its passage through the tubes placed above the burner *G*. This arrangement is claimed to be new and is patented.

In the vehicles for two, the motor weighs 120 pounds; in those for a single person, a little less than 100 pounds.

Under the seat are the petroleum reservoirs with two conduits, one leading to the carbureter and the other to the burners. Forward at *N* is the supply of lubricating oil.

Speed changes are effected (Fig. 2) by gears, encased in a box *D*, under the frame *A*. These gears are controlled by a lever *E*, and give four speeds, 4, 10, 15 and 20 miles an hour.

By a special system the motor may be thrown entirely out of gear. This system consists of a manchon fixed upon a secondary shaft, and on which are arranged a series of toothed segments like piston rings, which throw the motor in gear when they disengage and throw it out when they engage, by means

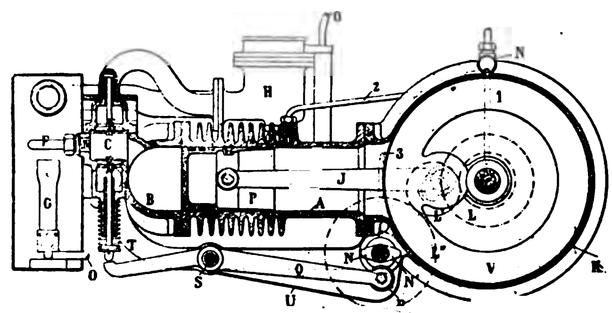


Fig. 1.

of a pedal *I*, which at the same time brings into play a brake acting on the pulley *H*, attached to the secondary shaft A second brake *F* is operated by the lever *G*.

The steering *K* is effected by pivoted front wheels, ball-bearing and pneumatic tires being used on all the wheels.

The rear axle *L* carries no differential gear, but is turned in the middle by a single chain as in bicycles, with the same arrangement for regulating tension. The hind fork *J* being jointed at *Q*, the hind axle is claimed to compensate sufficiently for inequalities of road without the differential.

The carriage for one weighs nearly 500 pounds, for two about 575 pounds.

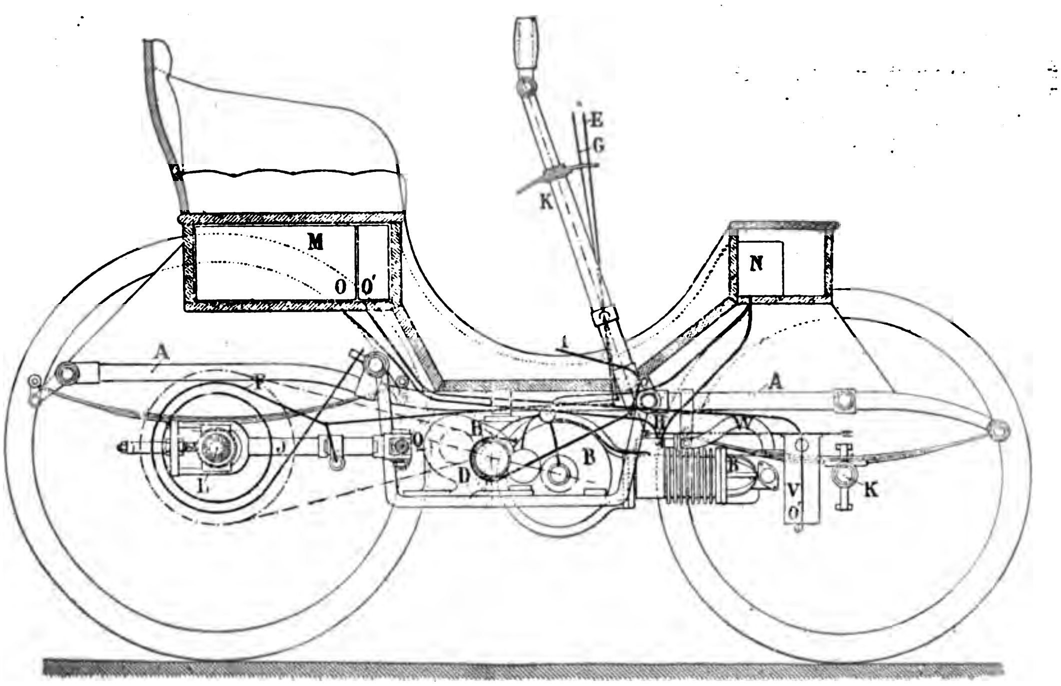


Fig. 2.

Competition for Hackney Coaches Set for Next Year in France.

The Automobile Club of France announces a contest for motor hacks to take place in April, 1898, and the committee in charge has drafted the following rules governing the competition :

Art. 1.—Under the patronage and direction of the Automobile Club of France an International competition has been arranged for motor hacks or cabs.

Art. 2.—The meeting will be held in Paris on April 4, 1898, and the following days.

Art. 3.—Decision will be made to—

(*a*) The net cost of the day of hackney coach in general use in Paris, which shall accomplish a course of at least 37 miles in the space of 16 hours. To facilitate the trial, the distance will be accomplished in a single journey, according to the road.

(*b*) The ease and management of the carriage.

(*c*) The frequency of recharging; the extent of repairs needed, and the ease with which they are made.

Art. 4 —All vehicles shall be classed as follows :

I.—(*a*) Closed carriages with two places.

(*b*) Open carriages with two places, with hood.

(*c*) Mixed carriages, with two places, able to shut or open instantly.

II.—(*a*) closed carriages with four places, with accommodations for 70 pounds of luggage for each traveler.

(*b*) Open carriages with four places, with hood.

III.—Closed carriages with six places, with accommodations for 70 pounds of luggage for each traveler.

Art. 5.—The vehicles must be constructed so that the number of travelers indicated can be comfortably seated. They must be furnished with a kilometric meter, with two brakes, one progressive and the other instantaneous. They must be capable of reverse motion. The position of the driver will be such that, having the regulating levers in hand, he can conveniently see the road in front of the carriage.

Art. 6.—The number of vehicles to be entered by each competitor is not limited, but a builder cannot enter several vehicles of the same tpye and dimensions.

Art. 7.—For every vehicle engaged an entrance fee of 200 francs must be paid up to February 28, 1898, and a double fee after that date. The list of entries will be closed on March 15, 1898, at midnight. Every application for entry should be accompanied by the entry fee, which will be deposited at the office of the Automobile Club of France.

Art. 8.—At least three days before the contest each constructor must send to the Committee:

1. The description of the vehicle and motor.

2. The distribution of weight on the axle.

3. A specification of the fuel operating the motor, and the quantity of fuel necessary for the day's work; indicating further if the charging of the carriage should be renewed during the prescribed course, which will require about 10 hours.

Art 9. The competitors must send to the localities designated by the committee the supplies of fuel needed for the entire contest. The committee will deliver to each driver a printed book and a sheet of the daily route.

On one of the leaves of the book the driver will give a receipt for oil, fuel, or the motive power which will be delivered to him on departing from the depot, or in the course of the service, if he requires to renew his supply. The water necessary for the working of the motors will be entered in the book under the supervision of the manager or the club's agents; if this water should be renewed in the course of the route that fact is also to be entered in the book. The daily route sheet is to be returned in the evening to the manager's office, signed by one of the managers or by the club's agent, who will have accompanied the carriage during the day. It will relate any important incidents which may have occurred during the day. Any excess of supplies over the amount actually used will be deducted each evening upon the return of the vehicle.

Art. 10. The trial will last for 15 consecutive days. Fifteen different routes will be selected, and each one of the vehicles engaged will be required to accomplish these routes in the order indicated on the daily route sheet. The route sheets will be arranged upon the basis of ordinary horse vehicles, so as to approach as nearly as possible the daily routine of a hackney carriage. The speed in Paris should not exceed 12 miles an hour. The speed on certain inclines indicated on the route sheet is to be noted. A special commissary, chosen from the members of the Automobile Club of France, will accompany each of the carriages during the trials. The vehicles should accomplish the number of trips and carry the weight of baggage indicated, or the corresponding dead weight.

Art. 11.—In the places chosen by the Automobile Club, where all the carriages will be housed, properly commissioned agents will be stationed with full control. These agents will deliver the supplies to the competitors, and will collect every day for the Committee the route sheets of the previous day and the receipts of the drivers. They will superintend the repairs which are to be made to the carriages or to the motors, pointing out the nature of the repairs. The repairs should be made before putting the carriage into the coach-house. These repairs should be recorded in a book.

Art. 12.—The recharging of the batteries of the electric carriages will be made under the supervision of the agents, but the responsibility will rest with the representative of the competitor, who should assist in it. The current will be furnished either by means of a special installation, or from the nearest public source. A special electric meter, of a type to be agreed upon by the committee, for each carriage, will indicate the quantity of the electricity stored, and the duration of each recharge. The expense of the electric charging will be borne by the competitors in proportion to the energy furnished to each.

N. B —The electric station of the Place Clichy has offered the kilowatt, from midnight to 5 o'clock in the evening, at a price of 30 cents, and the cost of recharging an electric carriage will be calculated on this basis, however it is accomplished.

Art. 13.—A jury composed of 12 members of the Automobile Club of France will be elected, six members by the committee and six by the competitors. The competitors cannot form part of the jury. This jury will draw up a report, giving the net daily cost of the running of each carriage and the regularity of the service. It should record its judgment on the elegance of the appearance, the noise of the vehicle and the convenience for passengers. This report will be communicated to the Society of Civil Engineers of France and to different societies, and an extract from it will be addressed to all the mayors of the chief towns of the department and district.

Art. 14.—Medals and diplomas will be given to the vehicles which best satisfy the conditions of service for hackney coaches in towns. If further prizes are offered the terms of the award

will be regulated by the commission, and the awards will be made by the jury.

Art. 15.—The competitors must conform to the decisions of the committee, particularly in the details of organization and tests.

Art. 16.—The ordinary civil and penal responsibilities attaching to road locomotion will rest with the competitors, it being well understood that the Automobile Club of France declines all responsibility whatever. The competitors should conform to all the ordinary regulations of the police in force for hackney carriages and motor vehicles in general.

The Velo Race for Motocycles.

The annual motor cycle race, under the auspices of *Velo*, the Paris newspaper, took place April 4. All kinds of motor cycles were eligible, provided their weight did not exceed 450 pounds. The distance was about 63 miles. The weather was so bad that out of 85 entries only 14 started, all mounting De Dion & Boutton tricycles. The riders were mainly professional bicycle riders or amateurs who have competed in previous motor cycle races. Of the 14 starters 10 were able to finish, the time of the winner being 3h. 9m. 5⅗s.

A Progressive Governor.

Gov. Busiel, of New Hampshire, is a strong advocate of electric railways and motor vehicles of all kinds as a means of developing his State, which at the present time is in the hands of the railway corporations. In an interview recently, at his home in Laconia, the Governor spoke at considerable length on the subject of motor vehicles and their influence on steam railroads. As the views expressed were very broad and just they are reprinted :

"All progress throughout the world has been obliged to make its way over ignorance, skepticism, selfishness and ridicule. The present steam railroads are the first to be made practicable in the great field of transportation up to the present time, but since the advent of electric motors and the use of electricity, gas motors, oil motors, and the use of compressed air, a revolution has been threatened in railroading and transportation generally. First, we have had electricity applied to street railways, which are considered by the steam roads a menace to their success, occasioned by the growth of sentiment endorsing this mode of transportation. Then we have the little bicycle, which has undoubtedly deprived the railroads of many thousands of dollars, and now it is said that the bicycle will be put onto the market with a motor capable of propelling it at a rate of 15 miles an hour and a run of 80 miles, without replenishing the oil from which the motor is made to operate. Then we are to have the motor carriage, from a jaunty trap to carry two or four persons to a hack or barge capable of accommodating an indefinite number. Now these vehicles will travel over the present highways and will necessarily come into competition with the present railroad system.

"I have no doubt that in the near future when you go to a livery stable to hire a carriage you will be asked the question, whether you want a motor carriage or one drawn by a horse; whether you want a motor bicycle, a motor buggy, or a motor hack. The speed you will be able to obtain and the comfort you will take in riding will be governed by the condition of highways. This will have a tendency to better roads and highways. A system of good highways will be established and maintained in first-class condition throughout the country. This must ensue as a natural result of the public demand brought about by the use of motor carriages.

"The effect of all this on the steam roads would be disastrous if they had not the same advantage over this new mode of transportation that they have now over the old. I mean that the present steam roads will be obliged to parallel and reconstruct their present systems and adopt a new method of transportation which will probably first be applied to their passenger business. They will be obliged to use one of the new forces, either electricity, compressed air or motors operated by gas or oil. This will take care of itself when it has been determined which of these is the most practicable and the cheapest.

"Advantage will come in increased speed and additional facilities. You no longer will have the present cumbersome locomotive and heavy cars, with the great expense of operating them, which amounts to about 70 per cent. of their gross earnings, but light, commodious, attractive coaches which will be timed to make at least 100 miles an hour on express trains at a greatly reduced expense.

"In order to obtain the highest state of perfection a road should have four tracks, two inward and two outward, with a block system or something equally as good, one inward and one outward track to be considered the main line and the other two to be used with a proper system of switches as side tracks, permitting the keeping in motion of trains at all times and allowing the faster trains to pass the slower ones without interfering with the local and slower trains.

"With such increased facilities and the high rate of speed obtained, the present railroad corporations will be just as far in advance under the new conditions as they are now under present conditions, and will do the larger part of the business just the same as they do now. The new motor carriage will take the place of the horse carriages of to-day as a matter of convenience.

"Before all this takes place, however, you will see the steam roads and present electric roads combined to secure legislation to prevent these motor carriages and bicycles making over six miles an hour, to prevent them from being competitors just the same as the steam roads to-day are using their influence to prevent the progress of electric roads. But as soon as the ownership of the new motor carriages becomes general all restrictive laws will be abolished from the statutes.

"Just so fast as the new system supplants the old you will see locomotives and cars stalled and going into decay and looked upon as the monsters that seemed to be necessary in this age to take care of transportation. Until the Almighty God shall see fit to deprive this world of scientific men and inventors we must be prepared for revolution in all things that depend upon the ingenuity of man, whether it be in the way of flying machines, paddle ships or some form of motor cars, of which we are not certain to-day, but which may be made possible to-morrow. You might as well try to stop the world from making its daily revolutions as to try to stop the progress of mankind, and the sooner the practical men look at the new conditions and adapt themselves to them the better it will be to the State of New Hampshire and the world generally."

You have my best wishes for your succes.

W. C. Ovenden.

West Boylston, Mass.

MINOR MENTION.

The Winton Motor Carriage Co., Cleveland, O., are now working twelve hours a day.

The Hyatt Roller Bearing Co. have removed their factory from 450 Market street, Newark, N. J., to Harrison, N. J., a short distance from the former city, on the Pennsylvania Railroad.

George Henry Hewitt, President, and J. Frank Duryea, Superintendent, of the Duryea Motor Wagon Co., Springfield, Mass., sailed for Europe, May 19, to look after the foreign interests of the company.

The American Society of Mechanical Engineers will hold its annual meeting at Hartford, Conn., May 25 and 26. The program includes a visit to the motor carriage department of the Pope Manufacturing Company.

The "John Scott Legacy Medal and Premium" of the Franklin Institute, Philadelphia, Pa., has been awarded to Henry G. Morris and Pedro G. Salom, designers of the electric vehicles patented under their names.

The motor vehicle bill which was reported as before the Committee on Roads and Bridges of the Massachusetts Legislature seems to have been tabled, as nothing further has been heard of it. Influences antagonistic to the new vehicle could probably explain.

Albert E. Spencer, of Brooklyn, N. Y., is the inventor of a cushion tire for vehicle wheels, consisting of a series of springs introduced between the tread of the wheel and an inner rim into which the spokes are fitted. It is intended as a substitute for the pneumatic tire.

The May issue of *The State's Duty*, a monthly magazine published at St. Louis, Mo., contains an article by Col. Albert A. Pope, President of the Pope Manufacturing Company, on "State Roads of Massachusetts." Official notice is also given of the Good Roads Convention to meet in St. Louis next October.

William G. Clark, 7 Guion street, Yonkers, N. Y., writes that just twenty years ago this very session he petitioned the Legislature of Massachusetts to build a State road in order to encourage the use of self-propelling vehicles. The petition was referred to a committee, who evidently gave the subject no consideration. The time was not ripe.

FOREIGN NOTES.

The projected tour of the Motor Car Club from Coventry to Birmingham on April 27 did not take place.

According to the *Autocar* a compressed air-motor carriage, with which an engineer named William Brakefield was experimenting in England, exploded recently with terrific force, fatally injuring the inventor.

It is proposed to construct an "automobilodrome" at the Boulogne, Paris. Translated from the French this word means a race course or driving park, where may be had every facility for the speeding of motor vehicles. Cyclists will be allowed on the track afternoons only.

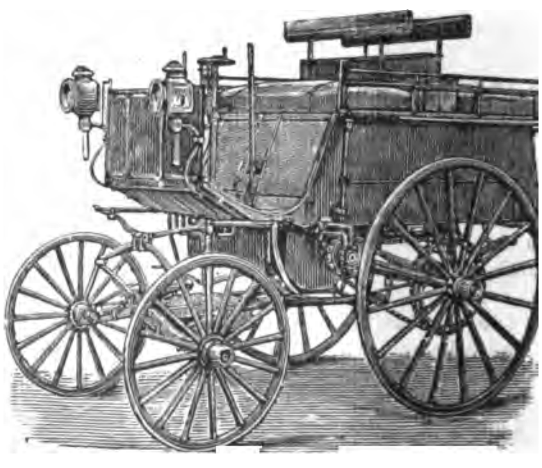
La France Automobile is organizing an annual race for moto-cycles to extend over a course of about 60 miles. The first contest will occur on June 20. Baron Zuylen de Nyevelt offers a special prize, termed "La Coupe," to any on[e] can gain the first prize two successive years. To co[mpete] vehicles should weigh not to exceed 425 pounds. The ent[ry] fees will be divided among the winners.

What might possibly be described as a "motor-car[...] ding" took place recently at Birmingham, Eng., the co[ntract]ing parties being E. A. Day, assistant manager of the [...] French Motor Carriage Co., of that place, and Miss L'H[ollier], daughter of Leon L'Hollier, who was one of the first to [intro]duce motor carriages into Great Britain. Some of the [...] came to the church in motor carriages, and Edmund [...]coigne, manager of the Anglo-French Motor Carriag[e] placed his carriage at the disposal of those who wished to [expe]rience the pleasures of a ride in the new vehicle.

A procession of motor carriages was recently organi[zed] Paris from the Tuilleries Gardens to the Bois de Boul[ogne]. Unfortunately the conditions were unfavorable for a d[emon]stration of this kind, which depended for its success upo[n] weather, and for hours previously the rain had fallen in a [...] downpour. Profiting by a temporary clearing up, ab[out] vehicles gathered at the starting place, a great many [...] competitors abstaining owing to the threatening weathe[r]. [At] the word of Count de Dion, who was riding one of his steam tricycles, the motor carriages started in single fil[e], went to the club-house of the Automobile Club by way [of] Champs Elysées, the Avenue du Bois de Boulogne an[d] lakes. After luncheon banners were distributed to the o[wners] of the six most artistic vehicles, the successful comp[etitors] being the Baron Zuylen de Nyevelt, who drove a brou[gham] propelled by a Phœnix motor; M. Peneau, who had a brake for seven persons; M. Trouette, a Delahaye car and MM. Maurice Faure, Dr. Love and Houry.

First Australian Motor Carriage

A most important event for Melbourne (Victoria) occ[urred] during February, 1897—no less than the passage th[rough] its streets of the first motor carriage. This vehicle [...] property of the Australian Horseless Carriage Synd[icate] was provided with a small Britannia petroleum moto[r].



was being driven from the engineers, who attached the carriage, to the coach builders, who were to pain[t and] upholster the vehicle. It is only an experimental co[ntriv]ance and was to be on view at a cycle show held [...] Melbourne Exhibition.

Recent Gas Engine and Motor Patents.

581,816. *Motor Vehicle.*—Robert J. Gibbons and Margaret A. Wilcox, Chicago, Ill. Filed March 14, 1896. Serial No. 583,220.

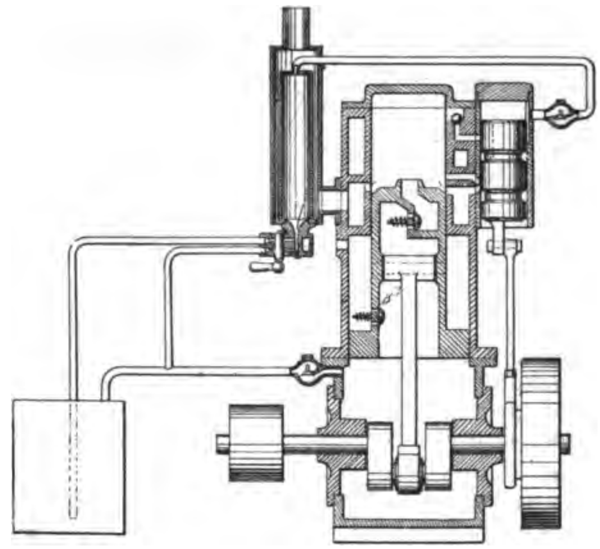
This relates to the transmission and control of the power in a motor vehicle. In this case a gas engine is assumed as the motive force, but any other source of power may be used.

The inventors claim that they have produced a motor-vehicle, which from the simplicity of the mechanism for starting, stopping, etc., can be managed without special skill or learning, and that the vehicle has great advantages accruing from the use of the variable speed gearing, especially in the quick way in which it answers any change of the operating wheel, and in its quick reversing, as the engine itself continues in its motion. Then by use of the automatic starter they provide a vehicle which is practically self-starting, and thereby are enabled to place all the operating parts in a complete housing, so that they will be unaffected by bad weather, etc.

In lieu of the valve for controlling the supply of gas and air to the gas engine a "controller" may be used to feed current to an electrical motor, and the shaft would then be used to operate this controller in a similar manner to that in which the valve is operated.

582,073. *Gas or Oil Engine.*—Frank S. Mead, Montreal, Canada. Filed Sept. 23, 1895. Serial No. 563,450.

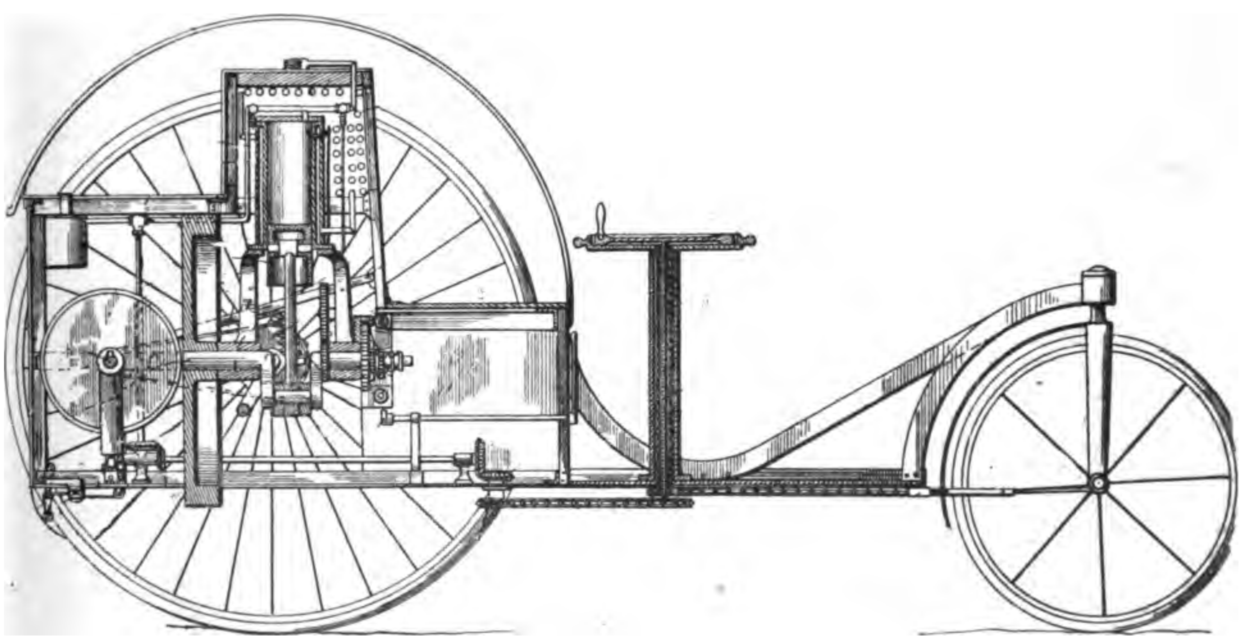
Claim.—In a gas or oil engine, a power cylinder, a working piston, an air-compression chamber, a spraying device, a connection from the working cylinder to the compression chamber, an independent connection from the working cylinder to the spraying device, a connection from the oil-supply tank to the spraying device, a direct connection from the air-compression chamber to the spraying device to supply the latter with compressed air, and a connection from the air-compression chamber to the oil-supply tank to force the oil to the spraying device by air-pressure, substantially as described.



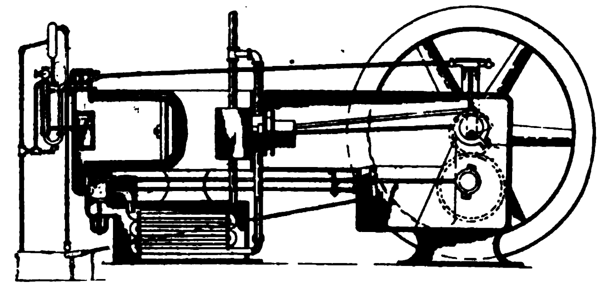
582,108. *Explosive Engine.*—Alexander Winton, Cleveland, O. Filed March 18, 1896. Serial No. 583,840.

One object of this invention is to provide an explosive engine with a mechanism for using the exhaust for the backward stroke of the piston, thus producing a compound engine and a considerable increase in the power and efficiency thereof, and at the same time a muffle for the exhaust to prevent the usual noise therefrom.

Another object of the invention is to provide an air cylinder for controlling admission of air and gas, and thereby the force of explosion, power and speed of the engine.



MOTOR VEHICLE, ROBT. J. GIBBONS AND MARGARET A. WILCOX, CHICAGO, ILL.



A further object of the invention is to provide a feeding arrangement or mechanism for the fluid of gasolene or other similar engines to prevent flooding, and yet always insure an adequate supply of fluid for the working of the engine.

Claim.—The combination with an explosive engine of a hydrocarbon feeder comprising a U-shaped pipe having one end open to the atmosphere, the opposite end in communication with the cylinder, a fluid supply at a point near the open end of said pipe, a fluid tank, a pipe opening into the air and fluid supply pipes at a point opposite the fluid-feeder to receive the excess fluid and deliver it to the tank, and a pipe in communication with the doubled portion of the U-shaped pipe and the tank, the parts adapted for the purpose described.

581,783. *Gas Engine.*—Thomas Small, Camden, N. J., assignor to George J. Richardson, trustee, Philadelphia, Pa. Filed April 11, 1896. Serial No. 587,184.

Claim.—The combination in a gas engine, of a cylinder having air and gas inlets, and a main exhaust port for exhausting the main portion of the products of combustion at the completion of each forward stroke of the engine, said port opening into the cylinder at or about a point coincident with the line of travel of the inner face of the piston when full forward, means for inducing the flow of an explosive charge into the cylinder at the completion of each forward stroke of the piston as the products of combustion are withdrawn from the cylinder, a piston in said cylinder, a high-pressure exhaust port to permit the escape of the products of combustion above the pressure of the atmosphere and an automatically operated one-way check valve provided in said port constructed to open before the main exhaust port is opened.

581,784. *Gas Engine.*—Thomas Small, Camden, N. J., assignor to George J. Richardson, trustee, Philadelphia, Pa. Filed April 11, 1896. Serial No. 587,186.

Claim.—A double-acting gas engine having two alternately-operating power cylinders, each having a reciprocating piston, automatically-operated air and gas inlet valves provided at or near one end of the cylinder, high-pressure escape valve, an exhaust port for exhausting the remaining products of combustion, and simultaneously drawing in a new charge, means for automatically igniting the charge when under compression, a double-acting pump, the opposite ends of the cylinder of which are connected with the exhaust ports of the power cylinders respectively for exhausting the products of combustion at or about the time the reciprocating piston of each power cylinder approaches the lower end of its said cylinder or full forward stroke, crank-shaft and connecting-arms and parts connecting the respective pistons to the said shaft.

582,271. *Oil or Gas Engine.*—Henry T. Dawson, London, England. Filed March 9, 1896. Serial No. 582,424.

582,532. *Igniter for Gas Engines.*—John W. Lambert, Anderson, Ind. Filed June 23, 1896. Serial No. 596,611.

582,539. *Motor Vehicle.*—Hieronymus Mueller, Decatur, Ill. Filed April 20, 1896. Serial No. 588,257.

582,540. *Igniter for Explosive Engines.*—Oscar Mueller, Decatur, Ill. Filed July 22, 1896. Serial No. 600,168

581,286. *Variable Direction and Speed Device.*—Silas L. Heywood, Minneapolis, Minn. Filed April 27, 1896. Serial No 589,285.

581,683. *Gas Engine.*—William O. Worth, Benton Harbor, Mich. Filed June 17, 1895. Serial No, 553,091.

581,730. *Ball-Bearing Retaining Device.*—Robert M. Keating, Springfield, Mass. Filed May 23, 1896. Serial No. 592,724.

581,772. *Ball Bearing for Carriages.*—Charles E. Roberts, Oak Park, Ill. Filed June 4, 1896. Serial No. 594,-252.

581,930. *Gas Mixer.*—George Alderson, La Salle, Ill., assignor to Charles Brunner, Peru, Ill. Filed May 6, 1895. Serial No. 548,285.

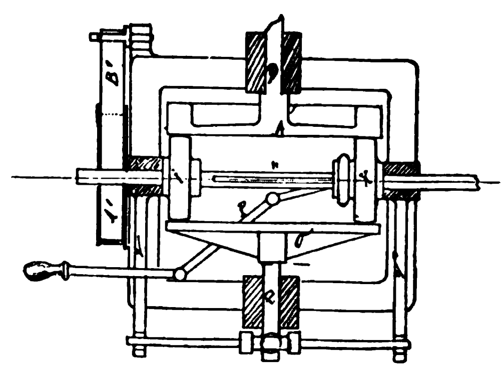


FIG. 5.

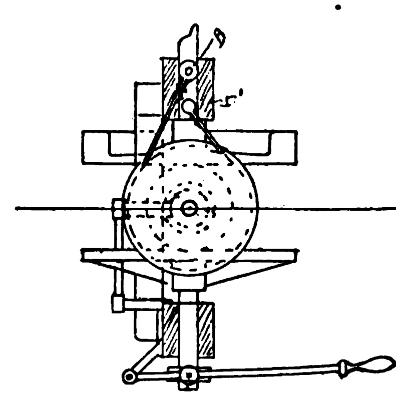


FIG. 6.

(See page 21.)

The Roser-Mazurier Motor.

A recent issue of *La Locomotion Automobile* gives a description of a novel motor in which the exhaust is utilized in a special cylinder, resembling a hot-air motor. It comprises two cylinders *A* and A^1, constituting the petroleum motor proper and operating on the Otto cycle, and a third cylinder *C* of the same diameter. (See Figs. 1 and 2.) The burnt gases coming from the two cylinders at a high temperature are employed to heat a quantity of gas previously compressed in the hot-air cylinder *C*. This previous compression, it is claimed, increases the efficiency and prevents a sudden expansion when the burnt gases reach the cylinder *C*.

The cylinders *A* and A^1 have admission valve *c* and c^1 and exhaust valves *d* and d^1, which conduct the burnt gases to the second motor *C* where the valve *k* regulates their admission. All these valves are mechanically operated by levers *f* and cams *g* acting upon friction rollers *h* (Fig. 3.)

The shaft *O* has three crank throws at 90°, with balance weight *P*. It is désaxéo by contact with the cylinders with the object of avoiding back pressure.

The cams *g*, regulating the motor by their automatic action upon the different valves are mounted on a rod *q* moved by the pinions *p*, *o*, *n*, *l*, in connection with the motor shaft *o* (Fig. 2.) The pinion *p* being twice as large as the pinion *o*, the cam rod *q* turns half as fast as the motor shaft. Hence an explosion is obtained, in each cylinder every other revolution, and motive impulse on the shaft every revolution.

The cylinders *A* and A^1 exhaust alternately into the hot-air cylinder *C*, which exhausts at every revolution through the valve *e*.

This motor is said to work equally well on gas, gasolene or kerosene, ignition being effected by the hot tube. Great economy is claimed for it, the inventors putting the saving at 30 per cent., the consumption of fuel not exceeding 300 grammes per hour per horse-power.

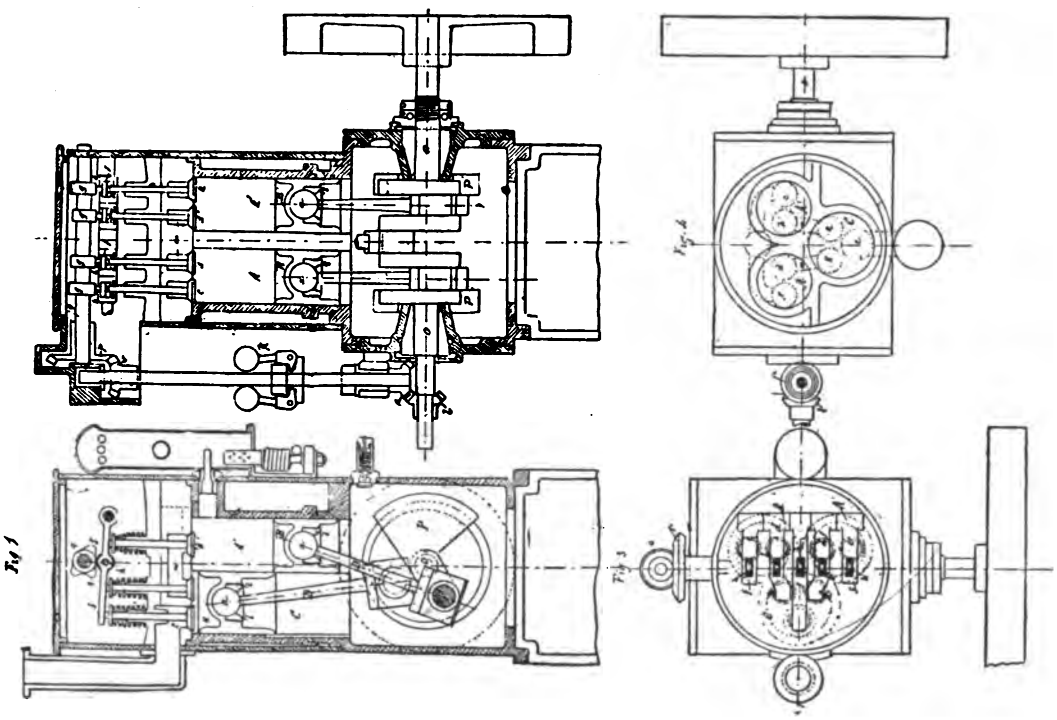
It is the intention to apply this motor to vehicles, and to this end a transmission by friction discs has been devised, represented in Figs. 5 and 6.

Three shafts, *D*, *H*, *Q*, are placed at right angles in the same plane, resting in four bearings. The shaft *H* carries two discs, the fixed discs *I* and the movable disc *X* guided by a key working in a groove.

To change speed the disc *X* is moved either toward or away from the centres of *A* and *O*. When the centre is passed motion is reversed.

To disconnect the power the lever is thrown back, moving the disc *O* away, while the two rods *V* bring the disc *A* out of contact. If the same lever is thrown further back the brake is applied, for the pulley A^1 then acts on the brake shoe B^1 whose two extremities are fastened at B^2 and D^1. To diminish friction the disc *A* is provided with ball bearings. As the disc *I* is loose upon the shaft and has a tendency to work away from the centre, one ball bearing is sufficient.

In a new construction, which the inventors have devised the hot air cylinder, will be placed between the other two in order to secure greater compactness. The three-horse motor, it is estimated, will then weigh only about 140 pounds.



ROSER-MAZURIER MOTOR. (See page 20 for further cuts.)

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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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THE HORSELESS AGE.

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The Flying Machine.

WE take pleasure in presenting to our readers in this issue an article from the pen of Mr. A. M. Herring, of Chicago, Ill., who for several years has been associated with Mr. O. Chanute, of the same city, in the study of the principles involved in the flying machine. His statement that motors of sufficient lightness and power for the propulsion of flying machines have already been produced, both for steam and gasolene, should silence those doubters who think a successful carriage motor an inventor's dream. The great difficulty yet to be overcome, however, is the changeable winds to which the machine must automatically accommodate itself to maintain its equilibrium. This is the task which the two Chicago aeronauts, in common with other investigators in the same field, have finally set for themselves. That they are able to report so much real progress in so short a time gives good ground for the hope that complete success is near at hand.

The Prevention of Noise.

AT last we are beginning to realize that there is a noise nuisance in our modern civilization, and a society known as the Society for the Prevention of Noise has been organized in New York to mitigate it.

The work is a most commendable one, worthy of the co-operation of all good citizens. The disastrous effect upon the human nervous system of the thousand and one discordant noises that make a Bedlam of a great city is not appreciated. The actual waste of time and strength due to this cause would foot up many millions of dollars annually, yet it seems to be accepted like scores of other nuisances and burdens under which the race groans as a necessary evil due to the multiplied activities of our modern life.

This is only partly true; noises may be generally divided into classes, useful and pernicious. Under the first class come the various warning signals which are found necessary for the protection of life in populous centers, and which, apparently, must grow in number as population increases and street locomotion keeps pace with its needs.

Of the pernicious noises the horse and the rough pavements provided for him are a most prolific source. The impact of horses' hoofs and the clash and clang of iron tires make up a large part of the disagreeable noises of a great city. Smooth pavements and motor vehicles running upon them will reduce this class of street noises to a minimum.

The Horseless Carriage of the Next Generation.

SOME SUCCESSFUL EXPERIMENTS.

BY A. M. HERRING.

In the general mind the flying machine is almost universally associated with some form of cigar-shaped balloon, and in newspaper "fakes" we find this class of machine universally portrayed, perhaps because with this type of apparatus free flight has, within certain narrow limits, been accomplished; but it is, however, scarcely within the range of probability that the flying machine of the future will possess any of the characteristics of the balloon. Instead of being lighter than the air, it will doubtless be hundreds, perhaps thousands of times heavier, volume for volume, and instead of depending on gas for its support, it will rest upon the air only while skimming rapidly through it, at speeds equal to but not many times greater than that of our fastest railway trains.

It is interesting to note that the nearest approach to human flight of modern times was attained only by the use of aerocurve machines. In 1894 the late Otto Lillienthal, of Berlin, built a huge bat-like machine, with curved, rigid wings, on which he was able to slide down hill on the air a hundred and fifty feet or so at a time.

In this machine the equilibrium was not automatic except in still air; nevertheless, his great skill and extensive practice eventually enabled him to make leaps from very high hills, and the flights became correspondingly longer. It was on a machine of this type that he lost his life in the early part of last August—a sad accident which has taken from the field of aerodynamic work one, if not the ablest, of its workers.

The transforming of a small horizontal force (the push of screws—for it takes a very great expenditure of power to produce a moderate screw thrust in air) into a much larger lifting effect is the main advantage which the æroplane or aerocurve machine has over the vertical screw, an advantage which makes the one type possible and the other not.

With a plain surface the necessary driving force becomes smaller and smaller in proportion to the lifting power as the angle of incidence is diminished. So that, theoretically at least, it becomes possible to float enormous weights on rapidly moving planes with a very small expenditure of power indeed. But these very greatest results now dangle before the inventor's imagination like the latent energy he knows to be stored in a lump of coal, of which he is able to turn but a small portion to useful account.

The aerocurve—an arched or hollow surface—has no such enormous limits to its theoretical possibilities, but on the other hand the lifting effect is far greater and the power required to drive it smaller than for the aeroplane at most angles and especially so at the best angles that we are ever likely to be able to maintain in actual flight.

While there is no theoretical reason why a continuous thrust of one pound might not be able to sustain 100 or even 500 pounds on an aeroplane, the utmost amount that the same thrust could (theoretically) sustain on an aerocurve would probably be somewhere between 18 and 23 pounds if we could accurately maintain the surface at just the exact inclination we desired. I use the word *if*, because the solution of this one point means solution of the problem of the flying machine itself.

Though their theoretical advantages are very great, we are met in the development of the aeroplane or aerocurve machine with difficulties of equilibrium and regulation, which until recently seemed well nigh unsurmountable.

At first sight the difficulties to be encountered in the development of the flying machine seemed purely mechanical and therefore (on paper at least) simple enough to master.

Nevertheless, but few of those who have built machines or models, and tried them in the open air, have failed sooner or later to come to the conclusion that the machine which (with present theories) works out best on paper is the one that is least likely to fly at all in the open air, although it may (and generally does) behave beautifully indoors. The reason why it acts otherwise in the open air is not far to seek—our theories do not take into consideration the very great peculiarities of the natural wind.

The skill required to operate a Lillienthal machine may be judged by the fact that out of possibly over 100 persons, including among them a tight-rope dancer and an experienced acrobat, but two persons besides himself have ever succeeded in making creditable flights.

Lillienthal depended on shifting his weight to meet the variations in the wind, but in high winds it was found that the changes occurred with such frequency and were so great in extent that even his "double-deck" machine was practically beyond control in a wind of over 22 miles an hour.

As a general rule, engineers who have not made an especial

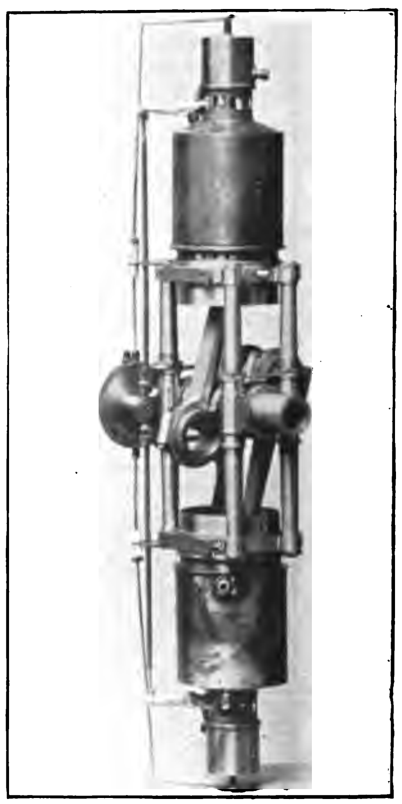
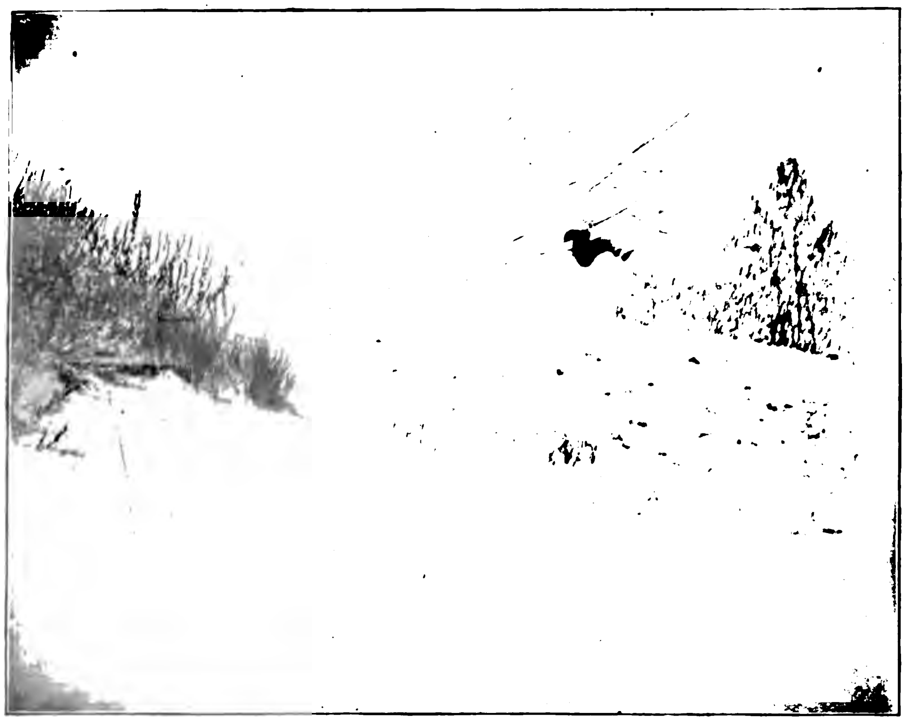


FIG. 1.

GLIDING MACHINE. SPEED CAPACITY, 12½ TO 60 MILES AN HOUR. SHOWN JUST AFTER STARTING ON 300-FOOT FLIGHT.

GLIDING MACHINE FITTED WITH AUTOMATIC REGULATOR FOR WIND GUSTS. SIZE, 14x6x8 FEET, EXTREME DIMENSIONS.



GLIDING MACHINE FITTED WITH AUTOMATIC REGULATOR FOR COUNTERACTING WIND GUSTS. SPEED, 19 TO 48 MILES AN HOUR.

INSTANTANEOUS PHOTOGRAPH OF REGULATED GLIDING MACHINE ON A LONG FLIGHT. SHOWS THE MACHINE 60 FEET FROM THE STARTING POINT (X) AND SEVERAL FEET ABOVE IT. THE LANDING POINT IS AT THE DOT NEAR THE EDGE OF THE WATER.

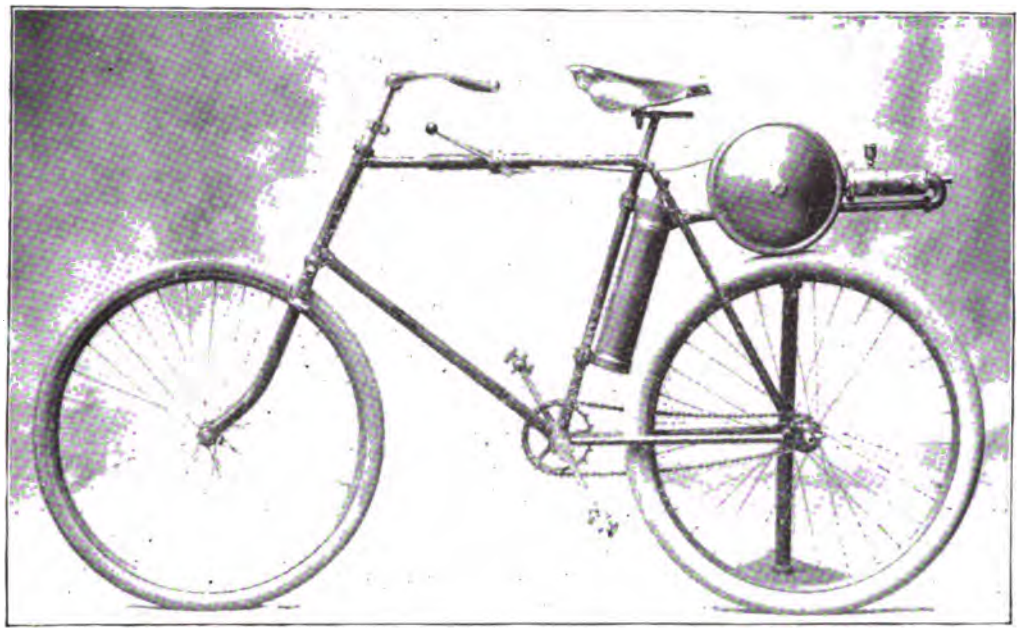


FIG. 2.—SHOWING MOTOR ATTACHED TO BICYCLE.

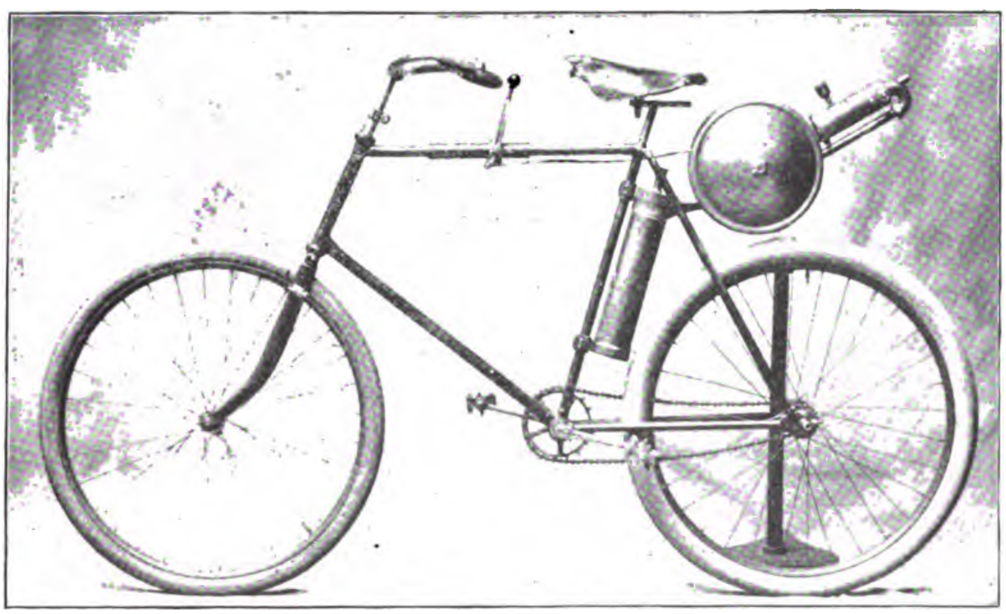


FIG. 3.—SHOWING MOTOR RAISED.

study of the flying-machine question are under the impression that the most important difficulty to be overcome is the obtaining of a very light motor; this is important, but the difficulty has been mastered, both with the steam and the gasolene engine.

Fig. 1 represents a 12-pound experimental engine of the latter type, built almost wholly of tempered tool steel. These engines are probably the lightest prime movers (in proportion to the power they furnish) ever constructed. The ignition is automatic except at starting, when a jumping spark is used from a Rhumkorf coil. Each cylinder has but one valve entering it, which forms both inlet and exhaust, and thereby keeps cool. The gasolene is boiled and enters the cylinder during the charging stroke after the majority of the air charge has been drawn in. The compression is carried to a very high point, making the ignition in contact with a prepared surface automatic.

Size of the engine is 3-inch bore, 3-inch stroke; valve, 1¼ inches diameter of clear opening. Thickness of cylinder walls, .035 inch; thickness of water jacket walls 0.006 inch. Power developed is over 2½ *brake*.

In Fig. 2 the motor is seen attached to a bicycle, all in gear for starting. The gasolene tank and carburetter increase the weight two pounds; the weight of the flywheel is 14 pounds, and of the igniting device and storage battery (for 400 miles) 10 pounds. The battery, which is not shown in the illustration, belongs below the gasolene tank, and the spark coil is carried in the tank.

When the motor is raised, as in Fig. 3, the connection with the tank and with the spark coil is automatically cut off.

The problem of obtaining a light, powerful engine has certainly been a difficult one—one that is solved, though not entirely to my complete satisfaction yet; however, this difficulty was insignificant beside *that of devising means to secure automatic equilibrium in winds of high velocity.*

At first sight there appears no connecting link whatsoever between those sudden changes which are met with in every wind. It was with the object of determining their character and effect that a long series of experiments were undertaken by Mr. O. Chanute and myself some two years ago. These experiments started with models and culminated last summer with the trial of several full-sized gliding machines embodying different features, in two of which were combined the conclusions reached after more than a dozen years of independent experimental work—both of these machines fly and carry the operator.

It would be easy, of course, to understand that, once the law governing the gusts or wind changes was known, however complex it might prove to be, a regulator would doubtless eventually be made which would automatically counteract them, but it would not be within the scope of an article of this character to give the experimental work which led up to the recognition of this law, nor explain the more or less complex theory of the regulators invented to meet it, further than to say that in the experiments conducted under the auspices of Mr. O. Chanute, at Dune Park, last year, two machines fitted with regulators were tried. The regulators in each were, however, materially different from each other both in theory and construction.

Of the four full-sized machines tried, the two fitted with the regulators proved to be by far the safest and most manageable (both of these machines are herewith illustrated). On them we were able to cover the longest distances horizontally in proportion to the height started from—a sand hill 40 to 45 feet high. It is to be remembered, of course, that these machines are purely experimental ones, and therefore were not provided with any propelling means whatsoever other than that furnished by gravity in descending from a height.

On the Lillienthal machine used, the longest flight obtainable from our starting point, in the course of 200 attempts, was only 116 feet long, against about 200 feet with the one regulated machine, and 360 feet with the other. This, however, does not represent the advance made, for where the safe limit of experiment with the Lillienthal was in winds of less than 18 miles velocity, that with the one regulated machine was over 25, and with the other above 31 miles an hour—the latter a gale, which is of comparatively rare occurrence—being met with possibly less than 15 days in a year.

The main and most important advance, however, has been that the equilibrium is now maintained automatically without the interference of the operator, who may now sit quietly in position, but who was taxed to his utmost strength and skill in using the Lillienthal machine in a wind blowing at only 18 miles an hour. During the late fall I made an improvement on one of the regulating devices and fitted it to a new machine with three superimposed surfaces. On this I experimented in winds up to 48 miles an hour, and succeeded in increasing the length of flight from 360 feet to 927.

The larger aerocurve machine in our tests was only 16 x 4 feet, with a rudder projecting seven feet in the rear. On this machine, speeds of nearly 60 miles an hour were obtained while the operator was on board. Both the speed and the machine were so completely under control, however, that out of possibly 1,000 flights no accident occurred which prevented the operator from making a comparatively gentle landing.

The sensation in "coasting" through the air is something similar to tobogganing, without the "drop" at the beginning of the glide, for in strong winds one often leaves the hillside horizontally or even on an ascending line, but when well clear of the rising current of air near the hill, an operator can (with a little practice) make the direction and speed until the ground is reached almost what he will. By shifting his weight forward, he causes the machine to descend where he feels himself gaining velocity at a tremendous rate. When within 10 or 12 feet of the ground, by moving easily back to his original position, the machine returns to a level keel and skims along with gradually diminishing speed for 60 to 100 yards, while the operator's feet dangle but a few inches above the grass and sand.

At any time, though, one may make a landing with less shock than would be experienced in jumping from the seat of an ordinary chair.

It would, however, be a mistake to imagine that it is very easy to learn to handle a gliding machine. The difficulties are certainly greater than those which must be met by a beginner on a bicycle—yet, the trick once mastered, it is doubtful if a bicycle can be handled with any greater ease.

In ordinary flight, the feet and one or both of the hands are comparatively free. Often during the course of trials in heavy winds the writer has been lifted on the crest of air waves (during the space of two or three seconds) from 40 to 60 feet above the starting point, he did not, however, experience the slightest embarrassment further than the fear that some point in the machine might prove to be too weak to withstand the buffeting of the wind. The machines, even in all these trials, however, *always retained an almost absolutely level keel.* Their behavior under such circumstances is good evidence that we are now in position to go a little further; that the time is near at hand when power may be added.—It remains, however, to be seen if this will not add a new difficulty to the already complicated problem of equilibrium; it is possible that it may not, and I am myself inclined to that view. It is altogether probable that in less than five years we will see the first one-man machine which can travel 60 miles an hour and cover 500 miles without stop.

The Winton Holds the Record.

On Decoration Day, May 30, the Winton motor carriage gave an exhibition mile against time on the race track at Cleveland, O., making a mile on a circular track in one minute and 48 seconds and breaking all previous records.

In just 60 days after the organization of the company, the first new and improved carriage was turned out, a picture of which is herewith shown. This machine has been put to every conceivable test and fully demonstrates the practicability of the self-contained hydro-carbon motor and its complete adaptability to road locomotion. It was given a road test of 60 miles from Cleveland to Elyria and return, and proved its perfect utility for every purpose to which a horse and wagon can be put. The day was warm and the roads torn up—undergoing repairs—and for a distance of six miles were a bed of sand; yet on hill or level, or sand, the motor went through without a hitch with four passengers and consumed only six gallons of gasolene. Five miles of the route were covered in 16 minutes and the running time was five hours for the 60 miles.

The Winton motor carriage resembles an ordinary trap with the seats back to back, each wide enough to seat three persons comfortably. The motor and driving mechanism are snugly concealed in the body of the vehicle and are self-lubricating. The wheels are 36 inches in diameter in the rear and 30 inches in front, and equipped with nickeled spokes, steel rims, and three-inch pneumatic tires. Ball bearings are used throughout, thus securing the greatest possible freedom from friction and wear. The body is supported on easy-riding springs and is handsomely finished in polished natural wood, nickeled trimmings, leather cushions and dash. It will be provided with a canopy top when ordered. The weight of the entire machine is 1,800 pounds.

The 10-hp motor of the hydro-carbon type is said to be compact, practically noiseless, odorless and free from vibration. It uses gasolene, carrying seven gallons, which the patent feeder converts to a fixed gas before entering the cylinders without any carburetter. It is very economical in fuel, and costs less than 1 cent per mile, carrying six passengers over ordinary country roads and city streets. The improved igniter is claimed to be positive in its workings, requiring no adjustment. Mr. Winton's perfected and patented pneumatic governor places the machine under perfect control, and by pressing a button the speed can be increased and held anywhere from zero up to the maximum power of the motor, which is capable of 30 miles per hour. The carriage is operated by a lever, which at will engages, releases or reverses the driving mechanism or applies the brake. The steering gear is simple and easily handled.

The company have a contract with the Automobile Company, of Cleveland, for their entire output of carriages, outside of vehicles for private use, and will shortly turn out a light phaeton motor, which will sell at a popular price, and will be fully described in their catalogue to be issued soon.

The Reeves Motor Carriage.

The Reeves motor carriage, invented by M. C. Reeves, of the Reeves Pulley Company, Columbus, Ind., is now being used in regular livery in the city of Indianapolis, at the stable of Cooper & Wood. As will be noticed, it carries seven passengers, and is operated by the person sitting at the left in the center seat.

It is mounted on ball-bearing axles and solid rubber tires, and is said to be practically noiseless and without vibration. The motive power is a six horse-power double cylinder, marine type, gasolene motor, mounted at the extreme rear, and with all parts entirely encased.

The distinctive feature of "The Reeves" vehicles is the speed-varying mechanism. This is placed intermediate between the motor and the rear wheels, and by its use any speed whatever can be obtained between the maximum and minimum, the range being one to ten. This change is said to be accomplished as easily, and in about the same manner, so far as the operator is concerned, as a motorman governs and controls his street car. By the same device the rig is run backward with every facility with which it is run forward.

Through this device the motor is given such an advantage of the load that the rear wheels may be slipped on the ground if the carriage is tied to something stationary.

Recently the carriage drew a tally-ho, containing 36 persons same distance over the streets of Indianapolis.

The builders claim that this machine, although not built for speed, will make 18 miles per hour over good roads and will take any grade where the traction of the rear rubber-tired wheels will carry it.

In actual experience, especially in cities, it is found that it is desirable to be almost continually changing speed. No set speed can be maintained for any length of time. This is accomplished on this carriage as easily as reining in the old family horse.

The Reeves Pulley Company are now completing three other vehicles, one for 20 passengers, to be operated in Chicago, which will have a 12-hp engine; one four-passenger vehicle for the Sintz Gas Engine Company, of Grand Rapids, Mich., and one two-passenger carriage to be used by members of the firm as an exhibition machine. This last will be mounted on pneumatic tires and will be put up more on speed lines.

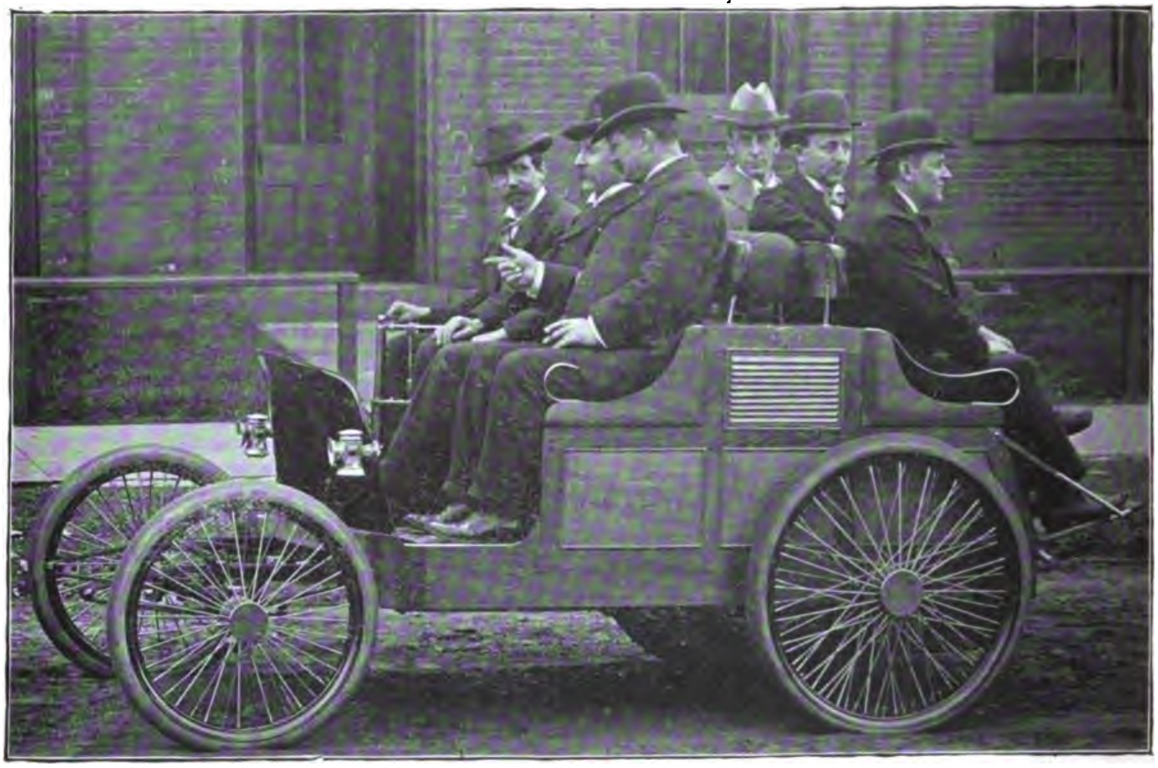
The Prall Rotary Motor.

W. Edgar Prall, Jr., Washington, D. C., writes that he has completed a rotary motor which runs easily and smoothly at a speed of 10,000 revolutions a minute, and at a steam pressure of 150 pounds, cutting off at quarter stroke, gives four-break horse-power. The weight, he states, is only 28 pounds.

He claims that his motor "is almost frictionless, all strains and pressures being perfectly balanced, and that as the power is transmitted torsionally through the shaft by direct effect and not by a crank there is no wear or leakage of the piston or packing. There is only one part of the engine in which there is any wear, the clutches, and that is taken up automatically, the engine requiring not the slightest attention or adjustment.

"The engine can be run as fast as a steam turbine, although it is a piston engine, using steam at the most economical rate of expansion, namely, expanding four times."

The American Motor Company, New York, have sold a 3-hp kerosene motor to Prof. Agassiz, the distinguished scientist, who is fitting out an expedition to South America. The motor will be used to operate an ice machine.



NEW MODEL WINTON MOTOR CARRIAGE.

GASOLENE MOTOR CARRIAGE. REEVES PULLEY CO., COLUMBUS, IND.

Recent Motor and Gas Engine Patents.

583,018. *Motor Vehicle.*—Herbert C. Baker, Hartford, Conn. Filed June 27, 1896. Serial No. 597,212.

In the drawings Fig. 1 is a plan view of the motor vehicle with the foot-board removed and with the seat represented by dotted lines, showing in full and dotted lines two positions, respectively, of the steering wheels. Fig. 4 is a horizontal section, on a relatively large scale, of a portion of the traction-wheel actuating and controlling mechanisms, showing a portion of one traction-wheel, traction-wheel shaft, a portion of the motor-shaft, and connecting and actuating instrumentalities between the motor shaft and traction-wheel shaft. Fig. 5 is a side view, on a relatively small scale as compared with Fig. 4, of a portion of the traction-wheel-driving mechanism and the shiftable speed controller, this figure representing by radial lines three different positions of the speed controller. Fig. 6 is a horizontal cross section of one of the steering wheels and a portion of its supporting and actuating instrumentalities. Fig. 7 is a vertical cross sectional view taken in line *c c*, Fig. 6, of the hub portion of a steering wheel, as seen from below in Fig. 6. Fig. 8 is an elevation of a portion of the steering-wheel carrier or axle showing the pivot block in which the horizontal pivot of the main frame of the vehicle is supported when the parts are assembled, as shown in Fig. 9. Fig. 9 is a sectional plan view of a portion of the steering axle and a portion of the main frame, showing the parts assembled in working relation. Fig. 10 is a cross sectional view taken in a line corresponding with the line *d d*, Fig. 9, and showing the shiftable connections between the steering axle and main frame of the vehicle. Fig. 11 is an enlarged plan view, partially in section, of a portion of the hand lever which actuates and controls the movements of the speed-controlling device. Fig. 12 is a sectional side elevation of that part of the lever shown in Fig. 11. Fig. 13 is a cross-sectional view, on a relatively large scale, of a portion of the driving mechanism and shiftable speed-controller, showing the parts as viewed from the left hand. Fig. 14 is a perspective view of the slide which controls the angular positions of the steering-wheels. Fig. 15 is a perspective view of the block which, when the parts are assembled, is shiftably supported in a guideway of the slide shown in Fig. 14. Fig. 16 is a plan view of a lock-washer used in connection with the nut that holds the steering-axle and main frame in operative relation, as shown in Fig 9. Fig. 17 is a plan view, on a relatively large scale, of a portion of the front end of the main frame, showing the steering and speed-controller actuating lever and accessories. Fig. 18 is a vertical cross-section, taken in line *f f*, Fig. 17, and showing the par s illustrated in Fig. 17.

The vehicle frame, constructed of metal tubes so disposed and connected as to form a rigid structure, may properly comprise a series of longitudinally disposed tubular sills or beams, the outer sills of which are connected together between the extreme ends thereof, by cross-ties, and the extreme outer ends of which sills are connected by a tubular end sill at one end and at the opposite end by a tubular traction shaft sleeve, which is transversely divided to form two axially-aligned shaft-supporting members.

The two side sills are arched at their middle portion, where they are connected by the cross-ties to furnish a convenient elevated support for a seat, which rests upon springs shackled to the cross-ties. The intermediate sills are of relatively large diameters, and extend somewhat below the arched portion of the sill, and are connected to said sills by hanger-tubes, as also to the end sill, and to the two-part tubular shaft sleeve.

The traction wheels of the vehicle are carried at the ends of a traction axle or shaft, journaled in suitable bearings in the traction shaft sleeves or tubular members, and the steering wheels are rotatably supported on spindles, pivotally mounted for horizontal movement upon the ends of a steering axle,

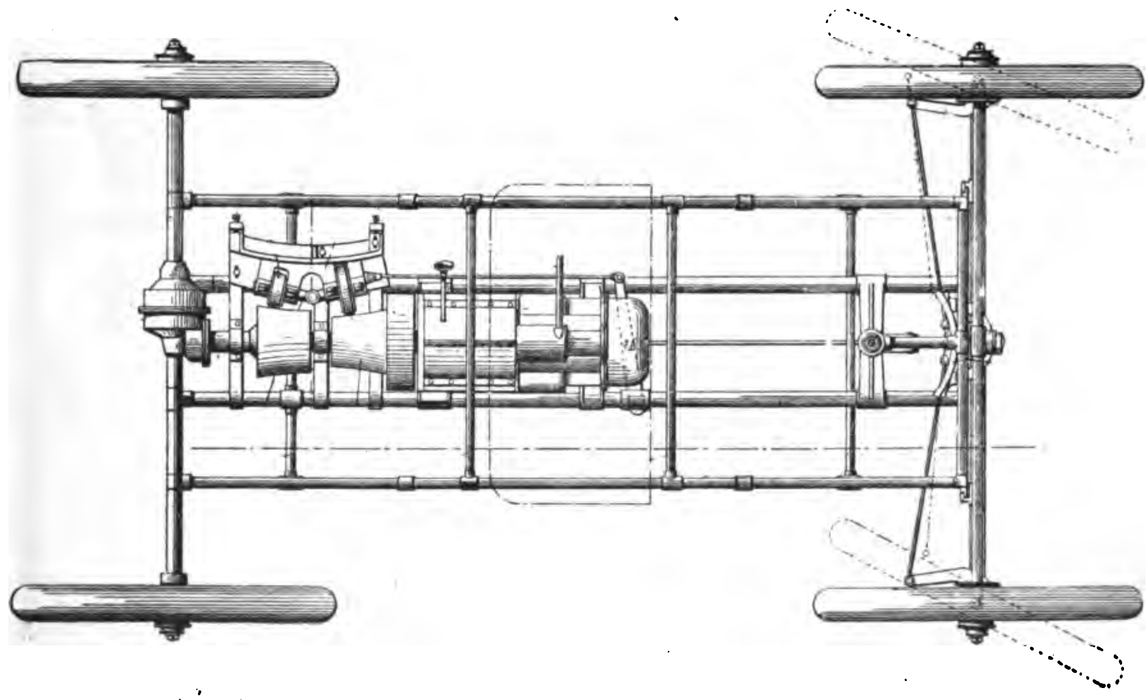
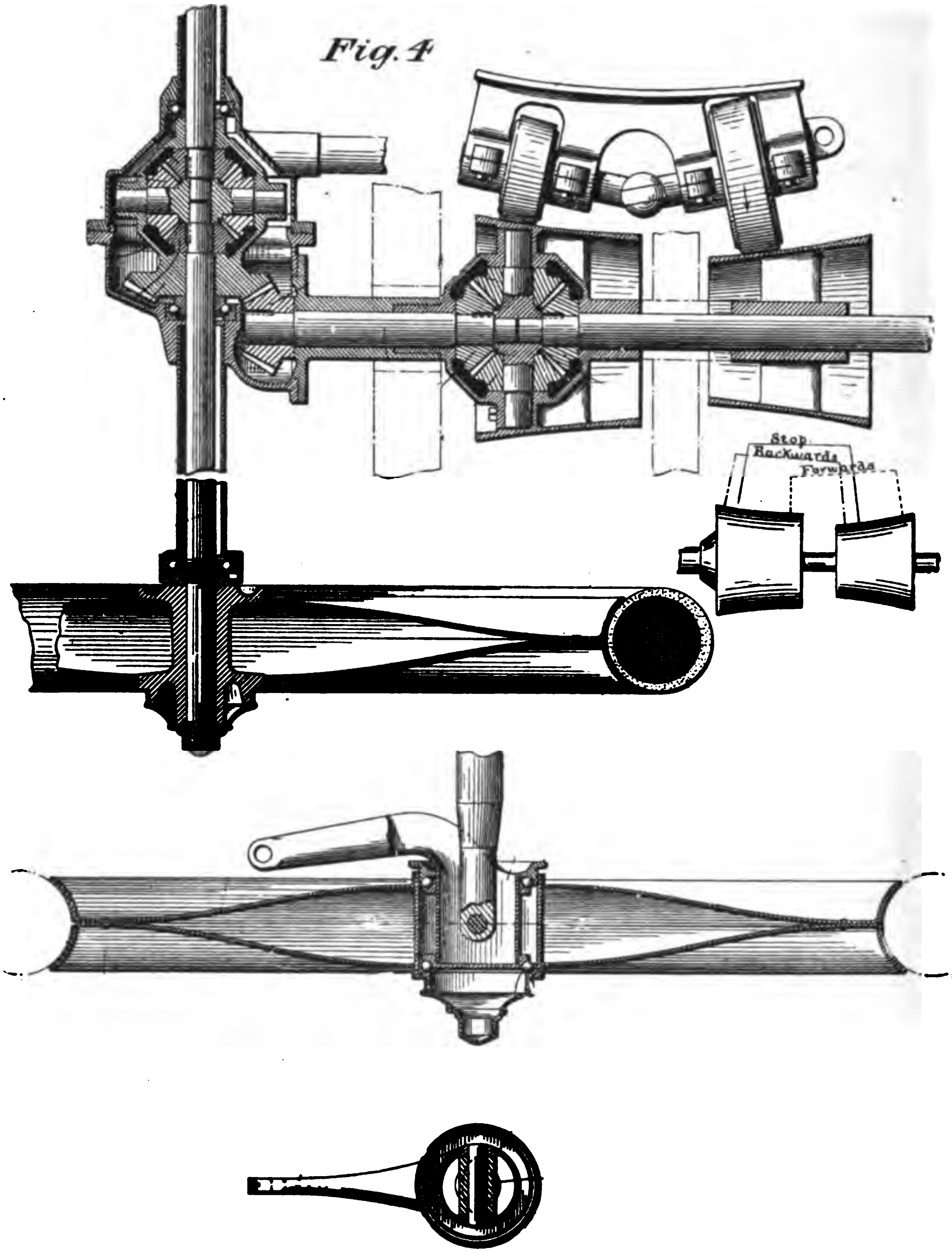
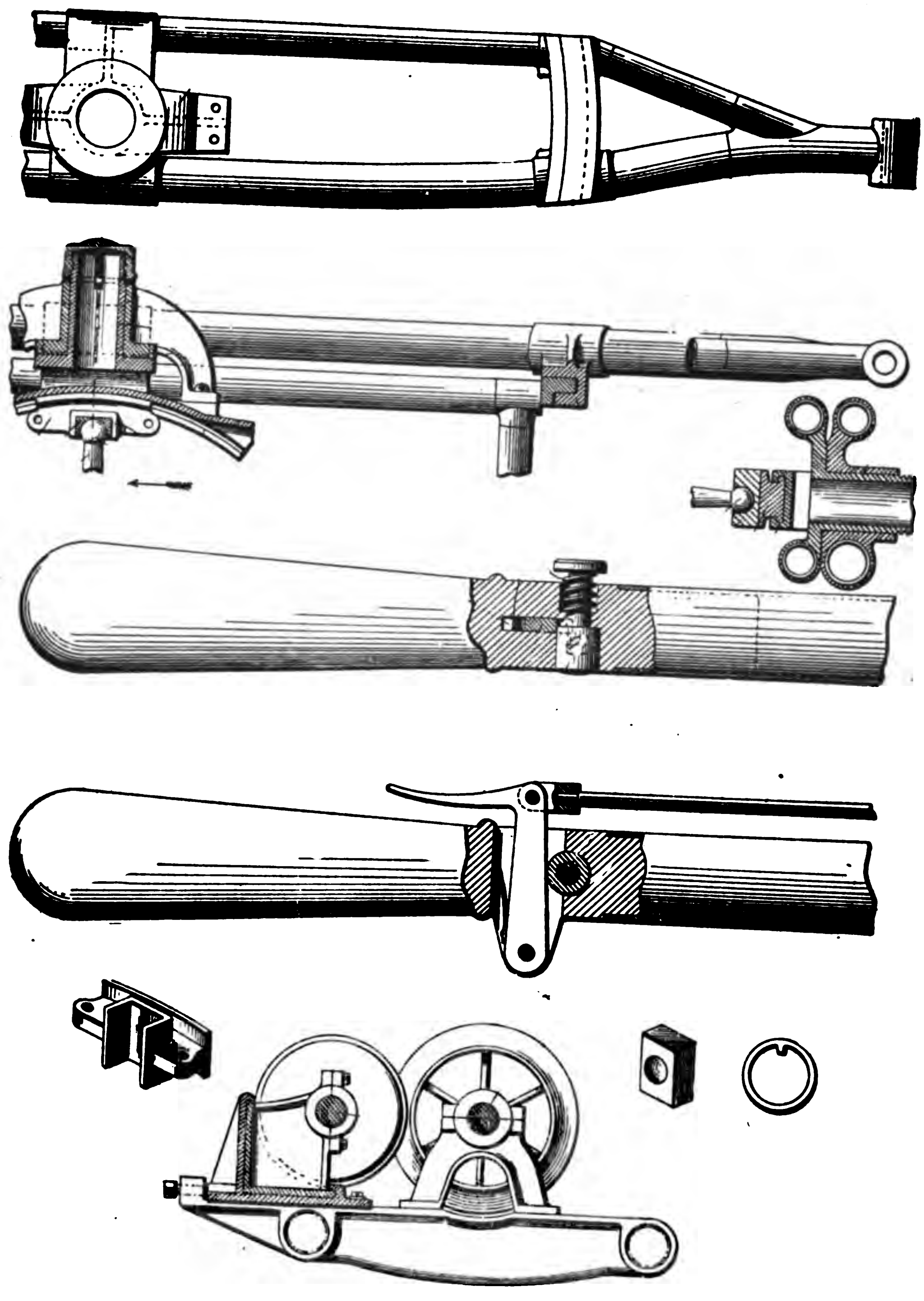


FIG. I.—PLAN VIEW OF BAKER MOTOR VEHICLE.



FIGS. 4-7.—BAKER MOTOR VEHICLE.



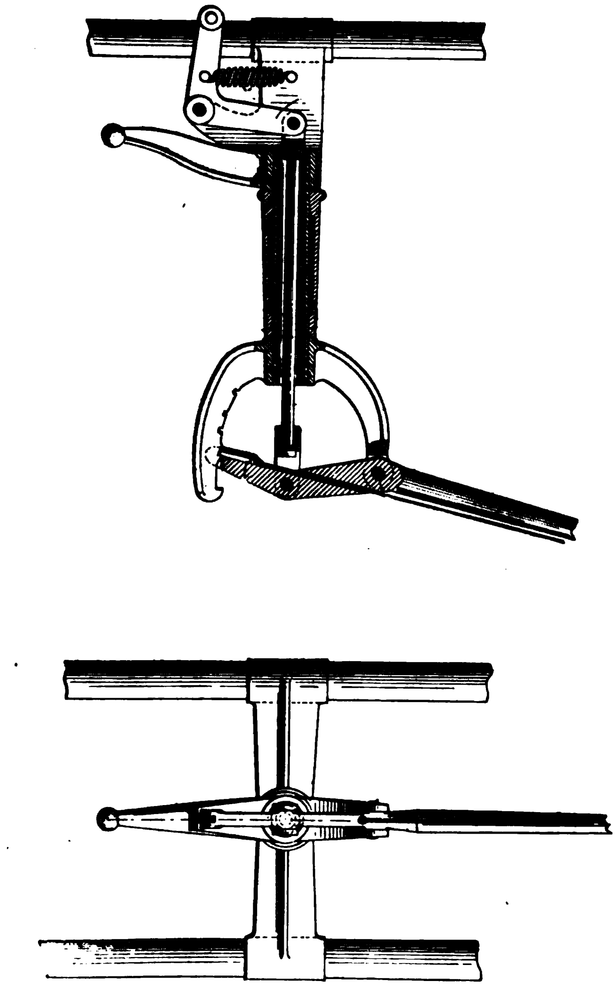
FIGS. 8-16.—BAKER MOTOR VEHICLE.

which in turn is pivotally mounted for vertical oscillation upon the end sill of the frame.

The differential gear comprises a drum or gear case located within a suitable casing, which constitutes a part of the vehicle frame. This gear case is journaled for rotative movement upon the adjacent ends of the two shaft members, and has a beveled gear in concentric relation with the shaft members, two oppositely-disposed bevel-gears of corresponding diameters fixed to the ends of the shaft members, within the gear-case, two oppositely-disposed duplicate bevel-gears or idle-wheels, journaled upon the opposite ends of a carrier mounted in the gear-case, which bevel-gears mesh at opposite sides with the bevel-gears before mentioned and have their axes of movement coincident with each other and at right angles to the axis of movement of the other two gears and a driving bevel-gear, fixed to an equational-box-actuating shaft journaled in a suitable bearing on the frame of the vehicle.

The driven and driving gears are of such relative diameters that they will effect a two-to-three ratio of movement between the gear-case and the actuating shaft.

By reference to Fig. 4 it will be understood that the planet-gears or idle-gears make two revolutions to three rotations of the shaft and that the bevel-gears, which are fixed to the traction-wheel spindles will, if the traction resistance of both traction-wheels is the same, rotate in the same direction at velocities corresponding to the orbital velocities of the idle-wheels. On the other hand, any reduction in the peripheral velocity of one traction-wheel due to an increased tractional resistance will result in a corresponding increase in the velocity of the other traction wheel.



FIGS. 17 AND 18.

The motor which is shown supported upon the intermediate sills of the vehicle framework has a power-shaft in axial alignment with the equational-box-actuating shaft. This motor, of the gasolene type, was patented by Mr. Baker, July 7, 1896.

The reversing, driving and speed-controlling mechanism comprises two independent conical friction drums of relatively different diameters, the smaller one of which is fixedly secured to the motor or power shaft, and the larger one is supported at its opposite ends for rotative movement upon the adjacent ends of the two shafts, said conical friction drums being set in concentric relation with the two shafts and having their apexes or their diametrically reduced ends in adjacent relation; two oppositely disposed bevel gears of corresponding diameters fixed respectively to the ends of the shafts. two oppositely disposed idle gears of diameters corresponding to the diameters of the bevel gears and meshing with the bevel gears at opposite sides thereof and which idle gears are journaled respectively upon the opposite ends of a carrier supported in bearings in a gear case, which constitutes a fixed part of the conical friction drum, a shiftable speed modifier consisting of a slide shiftably supported in a slideway on the vehicle frame; a shaft journaled for rotation in bearings in this slide, and two friction rolls or wheels in peripheral engagement with the two drums.

The differential train comprised in these gears constitutes a reversing driving connector between the two shafts and the conical drums in connection with the friction rolls, and their carriers constitute speed modifying instrumentalities for controlling the speed of the shaft with relation to the speed of the motor shaft.

The friction rolls are shown of relatively different diameters and carried by a two part shaft, the parts of which shaft are coupled together by a universal joint or coupling the friction roll being of a diameter substantially equal to the diameter of one cross sectional part of the friction drum by which it is rotated, and the friction roll being of a diameter equal to one-half of the diameter of one cross sectional part of the friction drum that is controlled in its movements by the friction roll.

The relative diameters of the friction drums and their respective friction rolls and the relative arrangement of these friction drums and rolls are shown in the drawings to be such that when the friction rolls are in the position shown in Figs. 1 and 4 one friction drum will be so held by the friction roll that it and the other drum will have a one-to-two ratio of movement, the first drum rotating at one-half the speed of the second, and when in this position—which may be consistently called the "stopping" position and which is designated by "stop" in the diagrammatic view Fig. 5—the orbital and rotative movements of the idle gears countervail each other, causing these gears to have no rotative effect upon the bevel gear, fixed to the shaft, and thus holding the shaft at rest, whereas, on the contrary, if the friction rolls are shifted toward the extreme right-hand positions (Fig. 5) this will result in the friction-drum being rotated with a gradually increasing velocity in what might be termed a "forward" direction, and if the friction rolls are shifted

toward their extreme left-hand positions, the drum will be rotated with a gradually decreasing velocity, thus causing the shaft to rotate in a reverse direction. Thus it will be seen that by moving the friction rolls, which are in constant engagement with the drums longitudinally of said drums and in one or the other direction described, the velocity of the shaft may be increased or decreased, and the direction of rotation of the shaft may also be changed, as will be readily understood by comparison of Figs. 1, 4 and 5.

The sliding carrier for the friction rolls is supported to have a shifting movement in the arc of a circle, and the peripheries of the friction drums are curved longitudinally to correspond to the arc traversed by the peripheries of the friction rolls. In such case it is advantageous to construct the friction roll carrying shaft in two parts and connect these parts by a universal coupling to adapt the same to the curvature of the peripheries of the friction drum.

The speed controller is connected by means of a connecting rod to one arm of a bell crank, pivotally supported upon an arm of an upright or post, secured to the intermediate sills of the vehicle frame. This bell crank is connected at its opposite end to the lower end of an actuating rod, which is pivotally connected at its upper end to a hand lever, fulcrumed upon an arm of a hand lever supporting bracket carried at the upper end of the upright or post. As a convenient means for arbitrarily setting and holding the modifier actuating lever in different positions, the lever carrying bracket is furnished with a curve arm or sector having lock notches in concentric relation with the fulcrum of the hand lever, and the hand lever is furnished with a shiftable spring actuated bolt, the outer end of which is adapted for engaging in lock notches formed in the inner face of a curved arm. This bolt is connected at its inner end with a thumb lever by means of which it may be retracted. This thumb lever is extended through a vertical opening in the hand lever and is pivoted to said lever, the bolt being normally held in its lock-notch engaging position by means of a spring bearing against the thumb lever.

For the purpose of insuring the engagement of the bolt with a lock-notch when the lever arrives at a position for setting the speed controller in its stopping position, the arm has one lock-notch, located in advance and out of the plane of the other lock-notches, and the bolt is normally limited in its advancing movement, so that while it will normally engage in the advance lock-notch it will freely pass the lock-notches without engaging; or, in other words, the lock-bolt is settable to two positions in an advanced direction, one for engaging in the advance lock-notch and the other for engaging in the lock-notches, and as a means for limiting the advancing movement of the bolt, so that it will be free to clear the lock-notches without engagement therewith and at the same time facilitate the engagement of the bolt with the advance lock-notch the inventor has provided, in connection with the hand lever, a shiftable bolt-limiting device, which consists of a push-pin supported in a transverse opening intersecting the plane of movement of the thumb-lever and having two portions of relatively different diameters, the enlarged portion of which normally engages the front face of the thumb-lever, as shown in Figs. 11 and 12, and holds the lever, so that the bolt will engage in the lock-notch only and will freely pass the other lock-notches. The push-pin is normally held in the position shown in Fig. 11 by means of a spiral spring, which surrounds the stem of the push-pin and is located between the head of this push-pin and a shoulder on the hand lever.

When it is desired to engage the lock-bolt with one of the notches the push-pin will be pressed inward sufficiently to bring the portion into juxtaposition with the thumb-lever, thus permitting the lever to advance sufficiently to enable the lock-bolt to engage in the notches.

As a means for automatically retracting the hand-lever to lock the same in its vehicle stopping position, we have a retracting device which consists of a spring secured to one end at the bell crank and at its opposite end to the upright. This forms a convenient means for automatically stopping the vehicle in case the speed-modifier-actuating lever is tampered with, or in case the operator from any reason loses control of the lever.

As a convenient means for supporting the steering wheels, so that the angular relation of the wheels may be changed to correspond to the arc described when the vehicle is run in a curved path and at the same time hold the steering axle against horizontal movement, the steering axle is furnished midway between the ends with a bracket, having a horizontal pivot bearing, in which is rotatably seated a horizontal pivot, secured to the middle portion of the front sill of the vehicle frame. These parts are held in operative relation by a nut, secured to and locked against rotative movement on the pivot, and the steering wheels are rotatably mounted on spindles, which are in turn pivotally secured for horizontal oscillation on the ends of the steering axle (Figs. 1 and 6). These spindles are of tubular construction and are pivotally connected with the opposite ends of the steering axle at points central between the opposite end of the hubs of the steering wheels, a construction which affords means whereby the steering wheels may have rotative movements in transverse directions upon intersecting axes.

As a means for changing the angular relations of the two steering-wheels to the proper degrees necessary to facilitate the movement of the vehicle in a curved path without cramping, the bracket is furnished with a curved guide on which is mounted a steering-wheel-actuating slide connected by means of actuating-rods to the angularly-disposed arms of the wheel-supporting spindles.

For the purpose of setting and holding the steering-axle in operative relation with the vehicle-frame, the axle is provided near each end thereof with a transversely-disposed slide, which engages a guide at the end of the front sill of the vehicle-frame (Fig. 9), abutments being provided for limiting the vertical movement of the axle with relation to the vehicle-frame, said abutments engaging a stop on the frame for this purpose.

The radius of the guide for the steering-wheel-actuating slide will be of a proper length and the position of the slide with relation to the wheel-spindles and the spindle-pivots will be such as to secure the requisite difference in the degrees of the angles of the two steering-wheels.

As a convenient means for shifting the slide to change the angular relation of the two steering wheels, and to do this through the medium of the same lever that actuates the speed-modifier, the bracket which carries the hand lever has a tubular rock shaft or stem, which is journaled for rotation in the bearing on the bracket-supporting post, and said rock-shaft is provided at the end thereof with a laterally-projecting arm, having a ball at the outer end, which is seated in a block, supported for vertical movement in a slideway on the steering wheel-

actuating slide. The rock-shaft is hollow to receive and permit a slight lateral movement of the rod, which connects the working end of the lever and the bell-crank.

By supporting the steering axle so that it may have vertical movements at opposite ends thereof and by supporting the steering wheels upon independent spindles and pivoting these spindles to the opposite ends of the axle, so that these wheels may be swung horizontally sidewise in a true circle of an axis that extends at right angles to the axis of rotative movement of the wheels, the inventor secures the proper angular deflection of the wheels necessary to facilitate the movements of the vehicle in the arc of a circle, and is enabled to run the steering wheels in different planes vertically without affecting the horizontal plane of the vehicle frame, thus obviating any rocking motion of the bed of the vehicle incidental to traveling over uneven surfaces.

To regulate the stress of the friction rolls upon the conical drums there is provided, in connection with the bracket which carries the slide of the shiftable friction roll carrier, means for shifting the rolls toward and away from the friction drums, comprising improved set or adjusting screws (see Figs. 1 and 13), which have screw-threaded bearings in bosses on the framework which supports these parts and which screws bear at their inner ends against said bracket.

To start the vehicle, assuming the motor to be running and the hand lever to be in position, it is simply necessary to press down the thumb piece or thumb lever which releases the bolt from the lock-notch, after which the inner end of the lever may be elevated, which in turn shifts the speed-modifier from the position shown in Fig. 4 toward the right-hand position, and through the driving mechanism effects a forward movement of the vehicle, the velocity of which is gradually increased as the speed-modifier is moved in this direction. If the hand lever is accidentally released after the bolt has been withdrawn from the lock-notch, the retracting device will return the lever to its normal vehicle stopping position.

Each steering wheel comprises a tubular hub and two metal disks having flanged central openings whose diameters correspond to the external diameter of the hub. These disks are secured to the hub at opposite ends thereof, and are bent inwardly and riveted together near the peripheries thereof, their peripheries being curved outward to form a concaved rim for receiving a pneumatic tire (Figs. 4 and 6). Each steering-wheel is supported at opposite ends of its hub by ball-bearings.

583,050. *Roller Bearing for Vehicles.*—Arthur W. Grant, Springfield, O., assignor to the Rubber Tire Wheel Co., same place. Filed March 5, 1897. Serial No. 626,111.

583,154. *Self-Propelling Vehicle.*—Reuben H. Plass, Brooklyn, N. Y. Filed April 20, 1895. Serial No. 546,557.

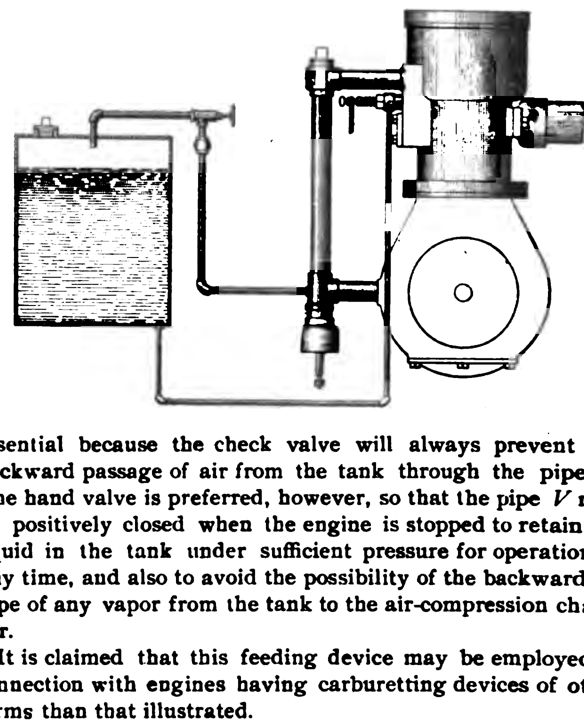
583,399. *Gas or Vapor Engine.*—George W. Lewis, Chicago, Ill. Filed July 15, 1895. Serial No 555,974.

As an improved means of feeding the gasolene or other liquid to an explosive engine adapted for use as a vehicle motor and under other circumstances, the construction illustrated has been provided. In the figure U indicates a tank for the liquid which is closed at its top and is preferably provided with a filling orifice *u*, made tight by a suitable closure. With the bottom of the tank is connected a supply pipe, H, which leads to the valve G, through the medium by which the liquid is supplied to the cylinder.

V indicates a pipe extending from the top of the tank U and communicating with the air compression chamber E. This pipe, V, is for convenience shown as connected with the pipe F, but the result would obviously be the same whether connected with F or directly with the air chamber. The pipe V contains a valve *v*, adapted for actuation by hand, and also a check valve *v'*, which opens toward the tank U.

The tank U will commonly be located below the level of the engine cylinder, and the apparatus illustrated is for the purpose of forcing the liquid from the tank to its point of discharge to the cylinder or carburetting apparatus. In cases where the tank may be located at a sufficient distance above the engine to give the necessary pressure, no such apparatus will be required.

When the hand valve *v* is opened, air from the compression chamber *E* is forced through the pipe *V*, past the check valve and into the tank *U* at each advance of the piston, so that after a few strokes of the piston the air becomes compressed in the tank to the maximum pressure within the compression chamber, any backward escape of air from the tank being prevented by the check valve *v'*. The liquid in the tank will thus be maintained under a practically uniform and constant pressure, by which it will be fed through the pipe *H*. The hand valve *v* may be used to close the pipe *V* to certainly prevent escape of air from the tank when the engine is not in use, but it is not



essential because the check valve will always prevent the backward passage of air from the tank through the pipe *V*. The hand valve is preferred, however, so that the pipe *V* may be positively closed when the engine is stopped to retain the liquid in the tank under sufficient pressure for operation at any time, and also to avoid the possibility of the backward escape of any vapor from the tank to the air-compression chamber.

It is claimed that this feeding device may be employed in connection with engines having carburetting devices of other forms than that illustrated.

Claim.—The combination with a power cylinder provided with an air-inlet port with a piston which uncovers the air-inlet port when at the limit of its power stroke, said cylinder being provided with a vaporizing chamber, one wall of which is formed by the side wall of the cylinder, and which communicates with said inlet port, an air-compression chamber, an air-supply passage leading from the air-compression chamber to the said vaporizing chamber, and a valve for delivering liquid to the said vaporizing chamber, said valve opening into the chamber between the air passage and the inlet port, and being provided with a passage for the liquid, a closure for the mouth of said passage and means for reciprocating the closure to expel the liquid at the mouth of the passage in atomized form into said vaporizing chamber, substantially as described.

582,620. *Gas Engine.*—James A. Charter, Beloit, Wis. Filed April 11, 1895. Serial No. 545,374.

583,586. *Electric Igniter for Gas Engines.*—George Westinghouse and Edwin Rund, Pittsburg, Pa. Filed Sept. 22, 1896. Serial No. 606,624.

In the illustration the igniting device is shown applied to a two-cylinder engine.

Claim.—In a gas engine, the combination, with a removable cap or bonnet, of a movable electrode having rigidly connected arms on or near its opposite ends, and which is adapted to make and break a circuit, an adjusting device on the outer arm, a spring for actuating the movable electrode and tending to close the circuit, a spring engaging a lever or tappet and tending to open the circuit, and means for actuating the movable electrode from the engine, substantially as set forth.

583,600. *Means for Obviating Smell of Internal Combustion Engines*—Gustav Langen, Philadelphia, Pa. Filed Jan. 14, 1896. Serial No. 575,516.

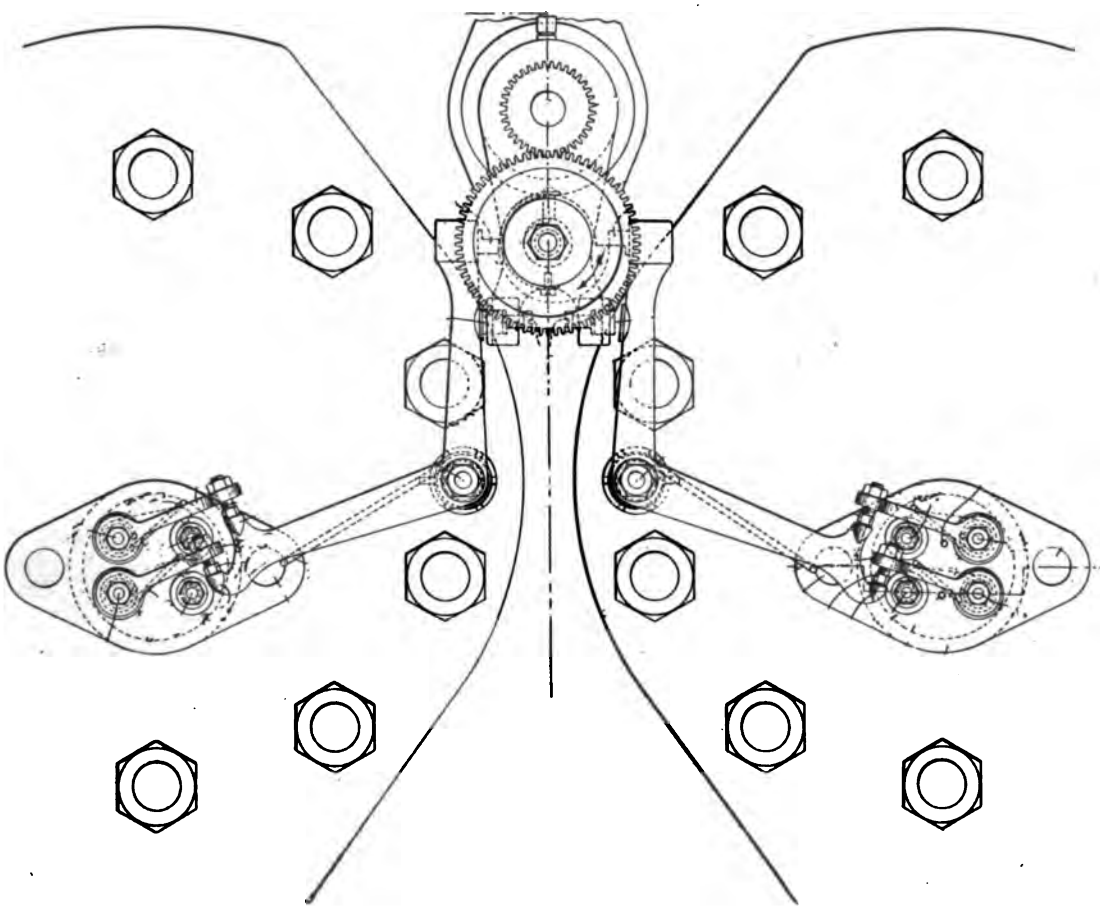
This invention contemplates certain improvements in the organization and operation of gas engines to obviate the ill effects due to the noxious elements of the gases and the annoyance due to their discharge from the engine. To this end a stream of water is caused to commingle with the exhaust gases in the pipe through which they discharge from the engine, and the water for this purpose is preferably waste water taken from the water jacket or cooling chamber of the engine.

The receiving vessel, into which the exhaust gases and waste water enter, is provided with a water overflow and a gas discharge pipe for the escape of the water and of the gases that are unaffected by the water. In some cases—as for instance, where the invention is applied to marine purposes—the pipe from the overflow of the receiving tank acts as a conduit for the water and the gases, and its discharge end extends outside the boat and discharges beneath the water when the boat is in motion.

When the invention is applied to a land or stationary internal combustion engine, a pipe extending upwardly from the receiving vessel is provided to discharge the exhaust gases above the building in which the engine is placed, and the water discharge pipe is provided with or formed into a water trap to prevent the gases flowing out of this pipe.

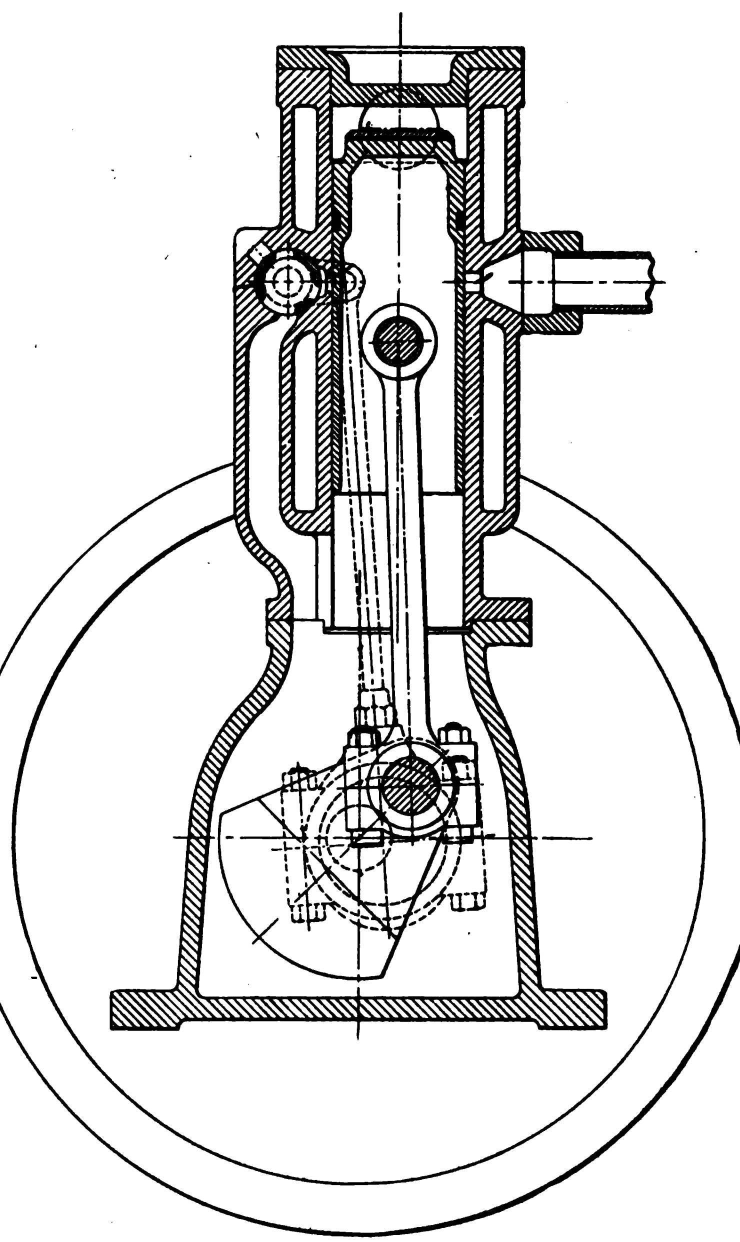
583,627. *Gas Engine.*—Lewis H. Nash, South Norwalk, Conn., assignor to the National Meter Co., New York, N. Y. Filed May 23, 1890. Serial No. 352,736.

583,628. *Gas or Oil Engine.*—Lewis H. Nash, South Norwalk, Conn., assignor to the National Meter Co., New York, N. Y. Filed Jan. 14, 1896. Serial No. 575,459.



ELECTRIC IGNITER FOR GAS ENGINES. WESTINGHOUSE AND RUND.

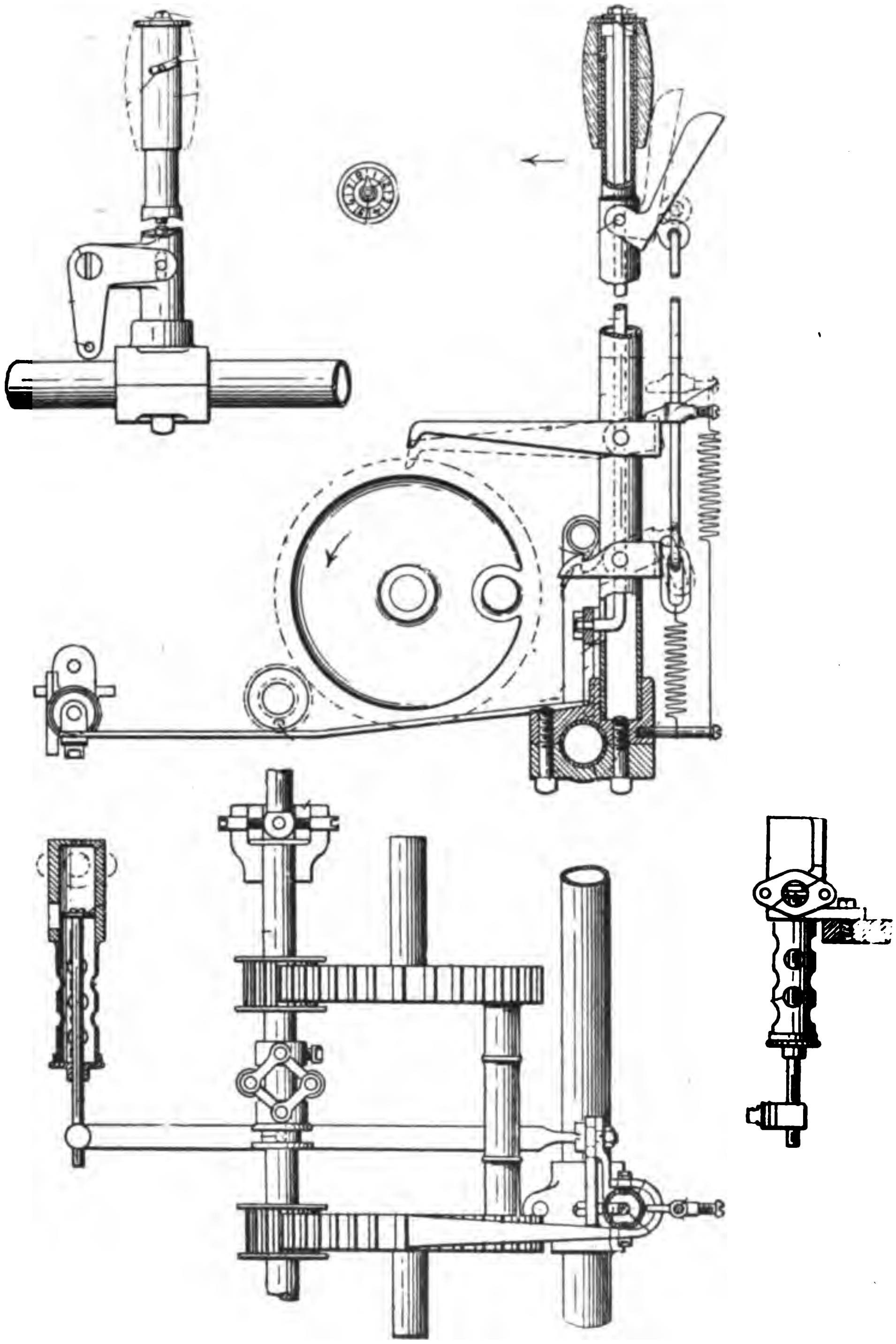
Air is compressed in the chamber by the downward stroke of the piston and is admitted to the power chamber when the piston is at the bottom of its stroke. In this position the upper face of the piston is level with or projects above the inlet port, due to the fact that it is contracted in cross section near the top. This upper portion of the piston deflects the inrushing current of air upward, causing a complete or nearly complete evacuation of the spent gases through the exhaust port. The piston ascending closes the inlet and exhaust ports and compresses the charge of atmospheric air in the power cylinder and in the evaporating and igniting chamber, which is in free communication therewith. While the piston is on its upward stroke oil is admitted into the igniting and evaporating chamber and is there converted into a vapor by contact with the hot walls of the chamber and is at the same time there mixed with a small portion of air. As the piston ascends compressed air is forced into the evaporating and igniting chamber, compressing the vapor above it, but not forming therewith a complete mixture until the piston on its upward stroke has passed the lower edge of the mixing chamber, when a jet of air is injected into that chamber, the velocity of said jet increasing as the space above the piston contracts; or, in other words, as the orifice through which the air passes into the evaporating chamber diminishes. Thus a jet of air is forced into the mixing chamber, which agitates and mixes its contents and forms a complete combustible mixture which is ignited by the hot walls of the chamber. The agitating jet of compressed air referred to is caused by the contraction of the clearance space. The explosion which follows drives the piston downward, and during its downward stroke air is drawn into the compression chamber. When it has reached its lowest position, the inrushing of compressed air clears the chamber of spent gases.



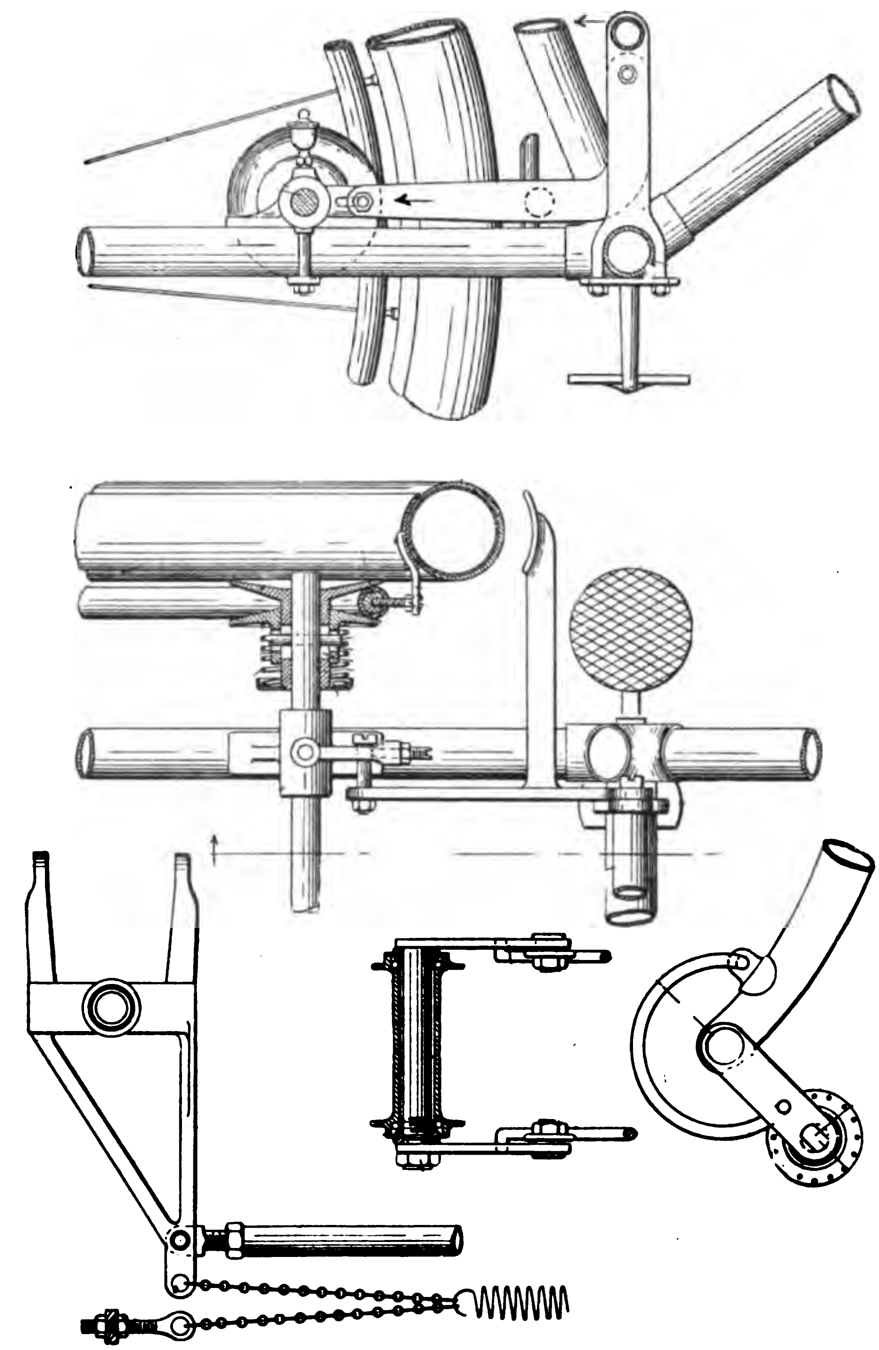
GAS OR OIL ENGINE. LEWIS H. NASH.

583,749. *Motocycle.*—Max E. Hartel, Chicago, Ill. Filed Feb. 24, 1896. Serial No. 580,315.

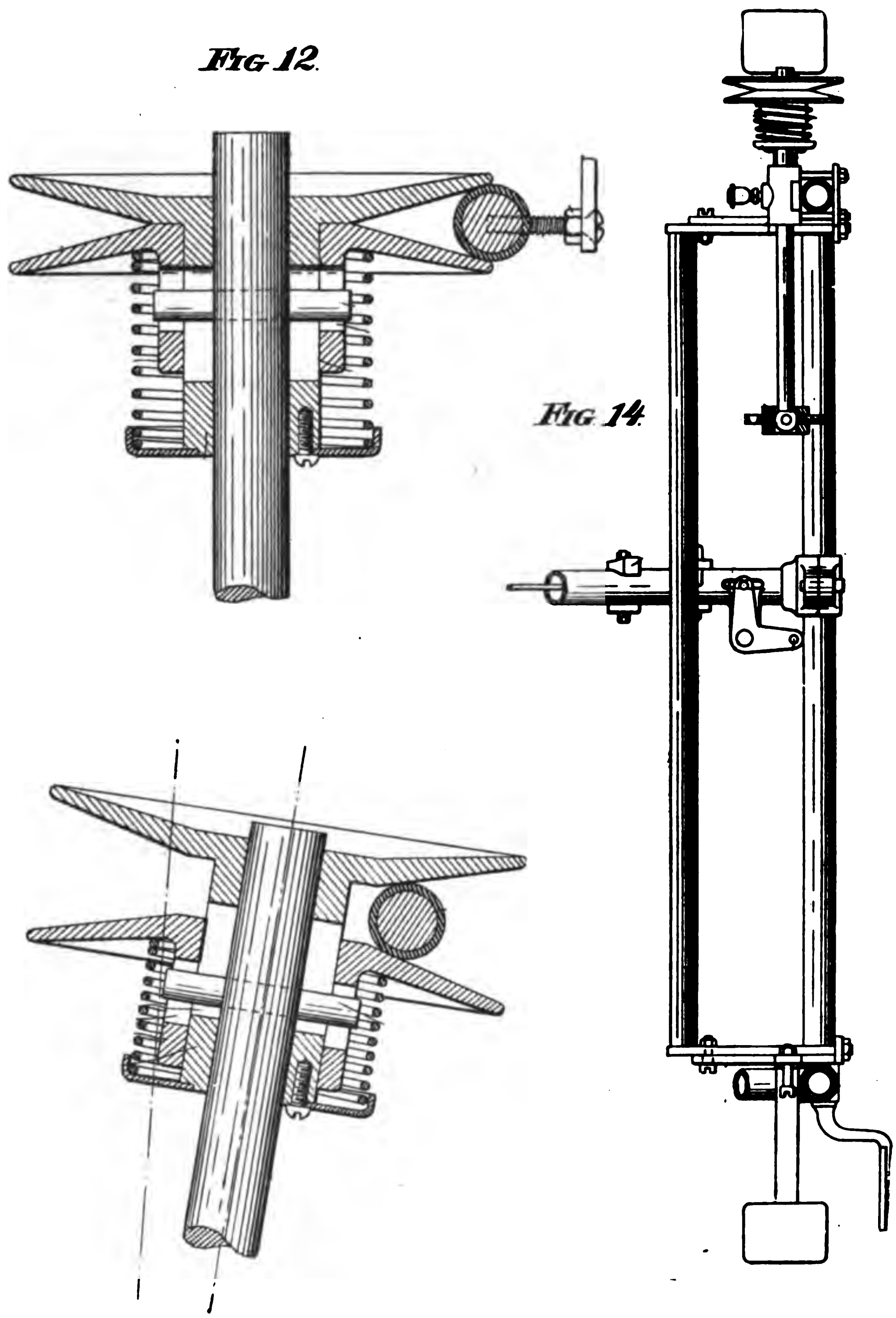
Fig. 1 is a view of a motocycle embodying the invention the near wheels and portions of the frame being omitted and the remaining parts being shown either in side elevation or longitudinal section. Fig. 3 is a sectional elevation of some of the parts, including the valve mechanism, a portion of the gearing for transmitting motion from the motor to the driving-wheels, and the single lever by which, in connection with devices carried by it, the operation of the machine is controlled. Fig. 4 is a view showing the operating-lever in horizontal section on the line 4 4, Fig. 3, and the other parts of Fig. 3 in plan view or horizontal section. Fig. 5 is a plan view of the valve-casing, the valve, and some of the valve-gearing. Fig. 6 is a rear elevation of some of the parts, including a portion of the operating-lever aforesaid (an intermediate portion of it being broken away) and some of the parts of the valve-operating mechanism. Fig. 7 is a view showing some of the parts in longitudinal section on the line 7 7, Figs. 2 and 8, and others in elevation, the principal parts in this figure being the brake, the separable members of the gearing for transmitting motion from the motor to the driving-wheels, and the means connecting the brake and one of these separable members, so that they move together. Fig. 8 is a view of the parts shown in Fig. 7, some of them being shown in plan and others in horizontal section. Fig. 9 is a plan view showing in detail the fork of one of the front wheels, its extension arm, and a portion of the mechanism for connecting said arm to the frame and to the corresponding arm of the fork of the other wheel. Fig. 10 is a section on the line 10 10, Fig. 11, looking into the direction of the arrow. Fig. 11 is a side elevation of a portion of the fork of one of the front wheels and the link mechanism by which the axis of the wheel is carried. Fig. 3[a] is a view of the end



FIGS. 3–6.—HERTEL MOTOCYCLE.



FIGS. 7-10.—HERTEL MOTOCYCLE,



FIGS. 12–14.—HERTEL MOTOCYCLE.

"Another feature of the invention consists in providing the valve-gearing with a part that is common to and connected with both the governor and the hand mechanism for operating the valve, so that said part may be moved and the valve thereby influenced either by the governor or by the hand mechanism.

"Another feature of the invention consists in providing the separately-swiveled steering wheels with extension-arms and so connecting them by means of a rigid rod that the wheels are held in proper positions with relation to each other.

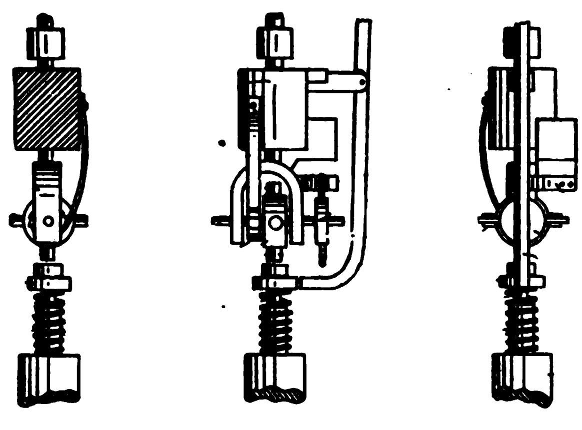
"Another feature of the invention consists in incorporating a spring in a connection between arms projecting from the forks of the front wheel and connecting the opposite end of this spring with the frame, whereby the front wheels are held in the planes parallel with the rear wheels.

"Another feature of the invention consists in journaling each of the front wheels of a motorcycle or the front wheel of a bicycle or other vehicle upon an axle which is supported by and rigidly connects a pair of links located upon opposite sides of the wheel, which links in turn are pivoted to the prongs of the fork and extend backward from their pivotal points, the links being held in normal position by springs of the particular shape hereinafter described."

583,495. *Gas Engine.* Harry B. Maxwell, Rome, N. Y. Filed July 13, 1896. Serial No. 598,926.

This invention relates chiefly to combined mechanism for operating the exhaust valve of a gas engine and making and breaking the circuit of the spark induction coil.

Claim.—The combination in a gas engine with the cylinder, shaft and eccentric, of the eccentric rod sliding in a fixed bearing at one end, a rotary shaft mounted on the end of the eccentric rod and carrying a rotary valve drum having projections and a rotary circuit maker having projections both secured on



the said shaft, an exhaust valve having a stem on which the projections of the rotary valve drum are adapted to engage, circuit springs with which the projections on the rotary circuit maker are adapted to engage, a ratchet wheel secured on the shaft with the rotary circuit maker and the valve drum and a stationary pawl operating on the ratchet substantially as set forth.

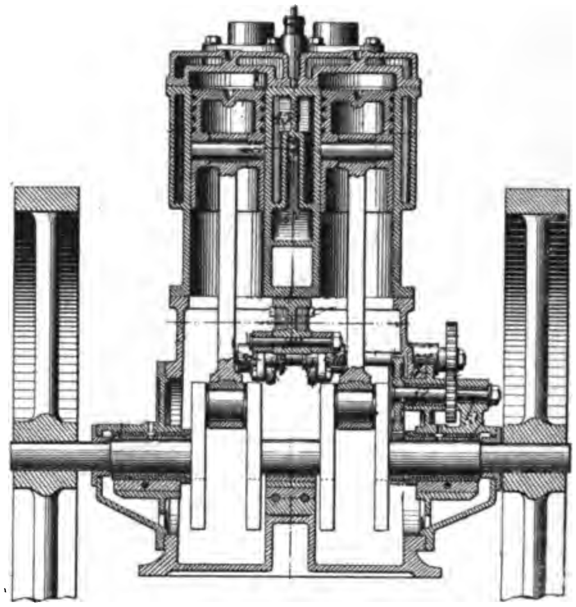
583,500. *Motor Cycle.* Hieronymus Mueller, Decatur, Ill. Filed July 22, 1896. Serial No. 600,162.

583,507. *Gas Engine.* John W. Raymond, Racine, Wis. Filed Jan. 13, 1896. Serial No 575,303.

583,508. *Gas Engine.* John W. Raymond, Racine, Wis. Filed Jan. 13, 1896. Serial No. 575,304.

583,584. *Gas Engine* George Westinghouse and Edwin Rund, Pittsburg, Pa. Filed April 22, 1896. Renewed April 29, 1897. Serial No. 634,463.

Claim.—The combination in a vertical gas engine of two single acting cylinders mounted on a closed crank case, a main shaft passing through the crank case, two similarly placed cranks on the main shaft, connections from the pistons of the cylinders to the cranks, a gear wheel on the main shaft within



the crank case meshing with a gear wheel on a counter shaft, a cam shaft which extends into the crank case and is geared to the counter shaft by gear wheels outside of the crank case, cams on the cam shaft within the crank case, and levers actuated by the cams and adapted to alternately operate the exhaust valves of the two cylinders, substantially as set forth.

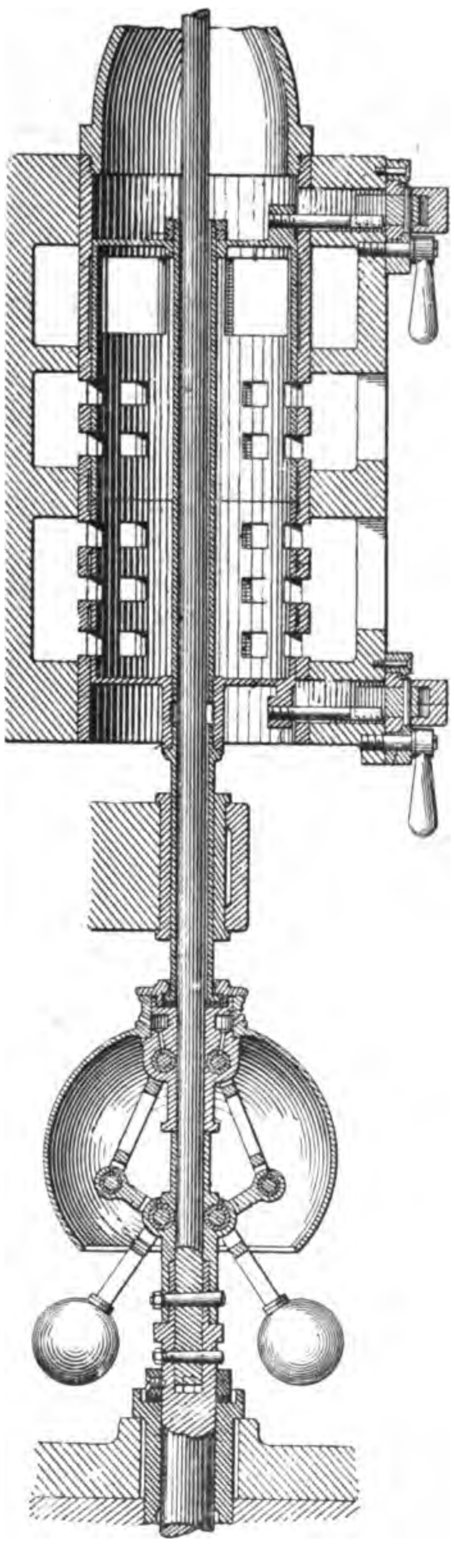
583,585. *Means for Controlling and Regulating Operation of Gas Engines.* George Westinghouse, Jr., and Edwin Rund, Pittsburg, Pa. Filed Dec. 7, 1896. Serial No. 571,386.

Claim—In a gas engine in which the operation of the engine is regulated by varying the quantity of air and gas admitted to the cylinder, the combination, in a valve device which is independent of the admission valve of the engine, of a mixing chamber, separate ports for the admission of air and gas to the mixing chamber, two connected members located and movable within the mixing chamber, one controlling the admission of gas and the other of air to the chamber, a governing device connected to and adapted to operate both members to control the quantity only of air and gas admitted to the chamber, and means for separately adjusting each of the members to vary the proportions of the air and gas admitted to the chamber, substantially as set forth.

583,779. *Process of and Apparatus for Deodorizing Oils.* James R. Whiting, Stamford, Conn., and William A. Lawrence, Waterville, N. Y. Filed Oct. 23, 1896. Serial No. 609,808.

Claim—An apparatus for deodorizing the lighter products of coal or petroleum, comprising a heating cylinder, a perforated inlet pipe in said cylinder, a heating coil in said cylinder, a container for charcoal, a perforated transverse partition in

said container, a pipe connection between the upper portion of the cylinder and the lower portion of the container, a lime water cylinder, a pipe leading from the upper part of the charcoal container through the wall of the lime water cylinder and nearly to the bottom thereof, the lower portion of said pipe being provided with perforations, a condenser communicating with the upper portion of the lime water cylinder, and a supply tank having a pipe communication with the interior of the lime water cylinder, substantially as specified.



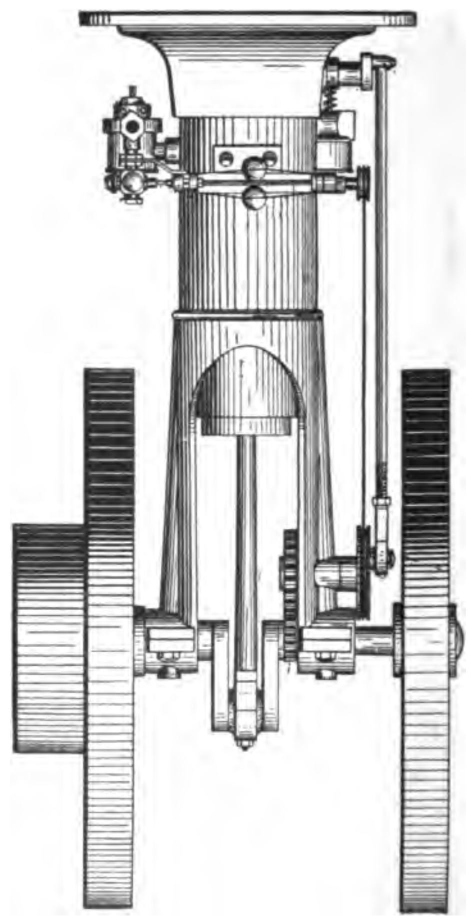
NO. 583,585.

583,809 *Steam Bicycles.* Hosea W. Libbey, Boston, Mass. Filed May 29, 1896. Serial No. 593,662.

Claim.—A bicycle consisting of a front steering wheel and a rear driving wheel connected together by a suitable frame, a bed plate between said wheels and below their center, a boiler mounted upon the front end of said bed plate, means for heating same arranged under the bed plate, a water tank at the rear of the boiler, an oscillating steam cylinder mounted in bearings below the bed plate, a crank shaft operated by the piston rod, and means for communicating motion from said crank shaft to the driving wheel, substantially as set forth.

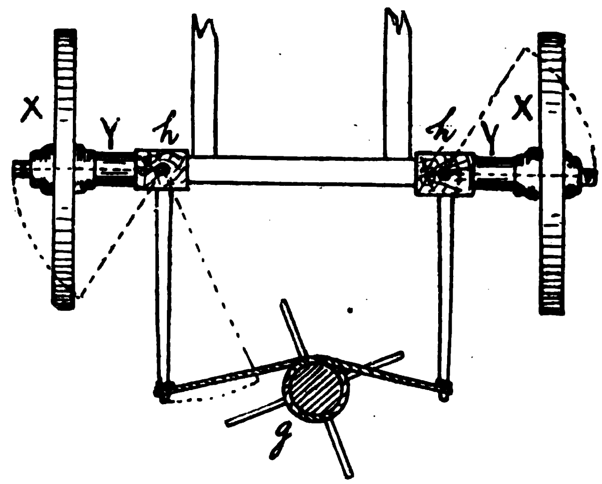
583,818. *Carbureter.* Frederick A. Redmon, San Francisco, Cal. Filed April 1, 1896. Serial No. 585,772.

583,872. *Gas Engine.* John H. Tuffs, Syracuse, N. Y. Filed Sept. 9, 1895. Serial No. 561,893.



The object of this invention is to provide an automatic mechanism by which the governor regulates the feed of gas, decreasing the supply as the speed increases and shutting it off entirely when a predetermined speed is reached, whereby when starting up the valve is normally wide open and is held in that position by a spring governor, and as the speed increases the outward throw of the governor balls releases said valve to be actuated by a spring behind it, to first partially close said valve and somewhat reduce the feed of gas, and as the speed increases to shut it off more and more until at a predetermined speed the gas is shut off entirely and remains so until the reduction of the speed elongates the governor and forces said valve open a distance proportional to the rate of such decrease of speed.

583,982. *Gasolene and Gas Engine.*—William F. Davis, Waterloo, Ia., assignor to the Davis Gasolene Engine Company, same place. Filed May 31, 1895. Serial No 551,325.



Origin of the Pivotal Steering.

In the current issue of the *Automotor* Rhys Jenkins, the well known English motor authority, proves quite conclusively that the pivotal steering now in common use on motor vehicles is of more ancient date than usually supposed. He says:

"In the 'Machines Approuvées par l'Academie Royale des Sciences,' tome iii, are given descriptions of carriages propelled by windmills brought before the Academy in the year 1714 by M. Du Quet. The figure herewith is produced from one of the drawings accompanying these descriptions. It will be seen that the wheels, *x, x*, are mounted upon short axles, *y, y*, each fixed in a vertical post, *h*, provided at top and bottom with pivots which work on suitable bearings in the framework of the carriage. Standing out from the posts at right angles to the axles are arms to which are secured the ends of a rope wound around a capstan, *g*, also carried in the carriage frame. The action of the apparatus will be quite clear from the figure."

The Rucker Motor Carriage.

The frame of this carriage is formed of two lateral tubes, *A A*, attached in front to a cylindrical condenser, *B*, which serves both as a connection for the tubes and as a receptacle for the cooling water. At the rear the tubes are U-shaped, supporting the motor between them.

There are two front wheels and one rear wheel, power being applied to the latter. All are fitted with pneumatics, and the front wheels are built exactly like the front wheel of a bicycle.

C C are the cylinders of the motor, C_1 C, the connecting rods, and *D* the shaft carrying fly wheels D_1 *D*.

Motion is transmitted to the driving wheel *E* by means of chains regulated by pinions D_2 D_3 and two gears of different diameter corresponding to the two speeds with which the vehicle is provided.

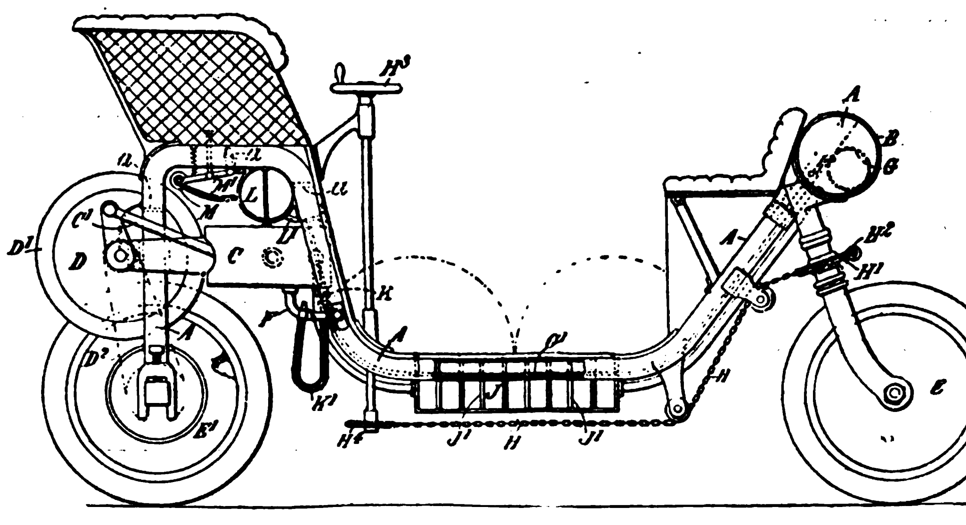
The motor operates on the Otto cycle. The water for cooling the cylinders passes from a tube *a* into the water jacket through small tubes *F*, and returns to the reservoir *B* through the other tube *a*.

Ignition is electric.

Steering is accomplished by means of a chain *H* acting upon the pinions H_1 fastened on the forks of the front wheels. The ends of the chain are fastened in front by means of a spring H_2 in order to relieve it of shocks.

The vehicle is managed by the lever H^3.

J is a muffler.



THE RUCKER MOTOR CARRIAGE.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

A SUCCESSFUL INVENTOR AND DESIGNER of Gas, Gasolene and Kerosene Motors, for stationary and road purposes, desires a situation in which he can have a moderate salary and an interest in his inventions. Address "OHIO," care THE HORSELESS AGE.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

A Splendid Opportunity.

Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE, which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection with a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

WANTED CAPITAL—To build and patent a new power Transmission for Motor Wagons. Will be gladly used by all motor wagon builders on royalty; will give 40 per cent. of patent. WESLEY KOUNS, Salina, Kans.

GASOLENE engines for motor carriages, cycles, launches, etc. Light, compact, powerful, reliable. Two actual horsepower, $135; three, $165; four, $225. Other sizes. Two old style 2 H. P motors, $90 each; guaranteed good. A D. STEALEY, 1353 26th Avenue, Oakland, Cal.

Designs and Estimates Wanted for the Following Horseless Vehicles:

One Enclosed Parcel Delivery Wagon. One Baggage and Express Wagon. One Pleasure Vehicle, seating from ten to twelve persons. Grades, 5, 7 and 12 per cent The Roads for the Pleasure Vehicle will be the hardest for travel being at times sandy, with ruts and holes, and short pitches of a 12 per cent. grade. These Vehicles must contain the best material and be guaranteed for not less than twelve months. All suggestions that will tend to make the best and most desirable Vehicles are asked for and will be received with thanks. Estimates for each Vehicle must be separate.

R. M. DALE, 861 Eighth St., San Diego, Cal.

G. H. EDWARDS, 519 Carroll Avenue, Chicago, patentee of the Trussed Tractor, illustrated in the March number, wishes correspondence with parties who take an interest or manufacture the same. It is the result of several years of experiment on the farm. It does the work at one-eighth the cost of horses.

FOR SALE.—Horseless Carriage, $600; cushion tires, gasolene motor. OWEN BROS., 472 E. Prospect Street, Cleveland, O.

FOR SALE.

THE EINIG STEAM CARRIAGE SHOWN ON page 19 of December issue of THE HORSELESS AGE, can be bought for half the cost to build. Address JOHN EINIG, P. O. Box 247, Jacksonville, Fla.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.

Price....................$3.00
Foreign.................... 3.25

A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.

Price....................$1.00
Foreign countries.................... 1.05

The Gas Engine. History and practical working. By Dugald Clerk. With 100 illustrations. New edition. 12mo., cloth.

Price....................$4.00
Foreign countries.................... 4.25

Auto-Cars, Cars, Tramcars and Small Cars. By D. Farman. Translated from the French by L. Serraillier. Preface by Baron de L. de Nyevelt. 258 pages, 112 illustrations, 12mo., cloth.

Price....................$2.00

A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.

Price....................$7.50

Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.

Price....................$2.50
Foreign countries.................... 2.75

IN PREPARATION.

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

We were more than pleased with the results from THE HORSELESS AGE.

THE PROUTY CO.
CHICAGO, ILL.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, JUNE, 1897. No. 8.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

PUBLICATION OFFICE:

216-218 WILLIAM STREET, NEW YORK.

SUBSCRIPTION, FOR THE UNITED STATES AND CANADA, $2.00 a year, payable in advance. For all foreign countries included in the Postal Union, $2.50.

ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

THE HORSELESS AGE will be sent regularly to advertisers, paid subscribers, and exchanges only.

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THE HORSELESS AGE, 216-218 William Street, New York.

Entered at the New York Post Office as second-class matter.

Sir David on Motor Traffic.

Sir David Salomon's recent address on "Motor Traffic" before the Society of Arts, London, was one of the most practical and thorough papers yet presented on this subject. For several years the learned lecturer, a scientific scholar of high attainments, has devoted much time and money to the investigation of the new art. He has visited motor factories of France, studied the mechanical problems involved in the motor vehicle, owned and operated steam and petroleum vehicles, and, as president of the Self-Propelled Traffic Association, has enjoyed exceptional opportunities for keeping pace with the development of the new industry in England.

In his discourse Sir David takes up the general principles of draft, rolling friction, road resistance, etc., and discusses them in a very clear and entertaining manner. His estimate of the pneumatic tire for motor vehicles falls below the common American opinion, for the reason, probably, that the roads of England are so superior to ours, and and that he refers in his data to a heavier class of motor vehicles than we have been able to experiment with here.

The advantages and disadvantages of the several systems of propelling vehicles are quite fairly stated by him, with the exception of the petroleum motor, which he regards as entirely out of place upon a road vehicle.

This extreme view seems unwarranted by the facts. Up to the present time the petroleum motor has outstripped all others for general utility, and is receiving from the inventive minds of the age a degree of attention that promises to weaken or remove altogether many of the objections he refers to. Sir David's favorite power, steam, is in need of considerable rehandling before it can become the strong factor in the propulsion of vehicles which he believes it is destined to be. But these necessary improvements in steam engineering he estimates lightly, even assuring us that they are already accomplished, while the possibility of like progress in the petroleum field he seems to overlook.

His remarks on "master patents" are sound and very opportune at the moment in England. The bullying threats of promoters should no longer block the industry there.

The "Engineer" Competition.

The *Engineer* motor vehicle competition, held at the Crystal Palace early in June, proved even more abortive than had been predicted. The arbitrary conditions laid down made success impossible. At the present stage of the industry no motor manufacturer cares to educate his competitors by giving out half a dozen sets of working drawings of his

vehicle, as was required by the rules. Nor was the scant and tardy recognition which gasolene motors received in the prospectus calculated to swell the number of contestants, for the attitude of the *Engineer* toward this class of vehicle has been anything but friendly from the start. In fact, its reputation as a carping and even hostile critic of the new locomotion undoubtedly deterred many from competing. The effect of the failure is temporarily depressing in England, but a single blunder cannot long hamper the onward march of a great industrial movement.

The Riotte Marine Motor.

C. C. Riotte & Co., 1955 Park Avenue, New York, are placing on the market a new marine oil motor made in ½, 2, 4, 6 and 8 horse power. Sizes below 4 horse power have single cylinders, while those above that have two. The motor runs at 400 turns and the 4 horse-power weighs 400 pounds complete, the fly wheel taking 180 pounds of the total.

The chief peculiarities of the Riotte motor lie in the valve mechanism, the starting device and the vaporizer. When the valve begins to lift a high leverage is exerted, but when it begins to shut the leverage changes and the valve closes slowly, avoiding the click so noticeable in most oil engines.

In starting the motor a small lever at the side is thrown out, relieving the pressure in part and back firing.

On the vaporizer is a dial which registers the exact proportion of air and gas employed.

The hot tube ignition is used.

A 27 foot launch fitted with a 4 horse power motor of this make, lies in the Harlem river, adjacent to the shop.

Mr. Pennington Returns.

HE WILL START A FACTORY HERE.

E. J. Pennington, inventor of the Pennington motor, who has been in England for some time negotiating his patents and promoting companies for the manufacture of his motor and vehicles, paid a visit to New York recently, bringing with him two vehicles, a three-wheeler such as has already been illustrated in our columns, and a four-wheeled vehicle of bicycle construction. The three-wheeler is a decidedly novel vehicle, having a very long wheel-base, 4½ inch pneumatics, foot boards at the sides for convenience in mounting and changing seats, bicycle saddle seats, one in front, one in rear, and two between, facing oppositely. To enable the riders to retain their places a curved railing extends around the two middle seats. Steering, which is very easy, can be managed either from the front or the rear seat. The motor, which is said to develop 12 horse-power at 850 turns, has two cylinders 4 x 10 inches, surrounded by copper water jackets supplied from a tank containing about three gallons. On the opposite side of the front is an oil tank, from which oil is distributed to the bearings and cylinders.

The rear wheel being the driver the power is transmitted direct from the motor by means of sprockets and chains, one turn of the motor giving a revolution of the wheel.

The pneumatics are bolted on, which Mr. Pennington claims is the only way a pneumatic can be kept on a motor vehicle wheel.

The machine is built of steel tubing, rubber, steel wire and copper, and although designed to carry four passengers and make a speed of 40 miles an hour if desired, it weighs only 350 pounds.

Cushioned seats will be substituted for the saddle seats in the tricycles manufactured for the market.

Mr. Pennington stated to the editor of the HORSELESS AGE, that he was here to start a factory, for the purpose of manufacturing his vehicles here. He will confine himself to pleasure vehicles entirely. He further said that he had sold the right under his patents in all countries where patents are granted with the exception of Canada, and that he had cleared from these various transactions one million and a half dollars. In corroboration of this statement he exhibited upon his person diamonds of which a rajah might have been envious.

Mr. Pennington will soon return to England, but in the course of five or six weeks he will again visit America in the interest of his business.

A Half Hour with the American Motor Company.

Among the improvements which the American Motor Company have recently made on their motors are a very ingenious automatic governor by which the speed of the motor can easily be regulated from 100 to 1,500 revolutions per minute, and a new coil which produces a jump spark without a vibrator. They are very busy on gas motors of all powers from ½ up to 50 horse power, and for all purposes, including electric lighting, agricultural uses, boats, vehicles, etc. A new motor, which is having a ready sale for marine and vehicle use, is their six-hp Tandem Twin.

MINOR MENTION.

Charles B. King, Detroit, Mich., is just completing the first lot of a line of two-cylinder 6-hp marine motors. He is also building a complete launch for exhibition purposes.

Dr. C. C. Booth, Youngstown, O., has disposed of his motor carriage, and will soon build another embodying improvements that have been suggested by his experience.

The Electric Carriage & Wagon Company are so well satisfied with the performance of the hansoms which they have been operating in New York for some months past, that they are about to organize a large company to put 200 of them in service.

Col. Albert A. Pope, President of the Pope Manufacturing Company, and W. A. Redding, attorney for that company, sailed for Europe, July 22, on the *Fuerst Bismarck*. Among the objects of the trip a glance at the motor vehicle situation in Europe is said to be chief.

C. B. Richard & Co., bankers and importers, 65 Broadway, New York, have imported a De Dion petroleum tricycle, such as has already been illustrated in our pages. The machine has been run quite successfully in New York streets, and the company above mentioned are considering the advisability of importing them for the market.

The Principles of Traction.

Editor Horseless Age.

Dear Sir: Having been for 20 years building and using traction engines, perhaps I can interest some of your readers by discussing in the light of experience some of the principles involved in traction matters.

To move forward a load that is borne up by a wheel, the axle of which is pulled along by some power not iu the wheel is one thing.

Like example 1, the thrust is straight downward, and if the ground is soft it sinks down till it finds a bearing But when you pull the load by the wheel, as in 2, then the thrust on the ground becomes oblique, and if the ground is soft the wheel revolves without advancing. The point of the wheel becomes as a blunt spade, and digs out a hole.

Whichever way it goes down it has to be lifted up again to go on, and for a given amount of work the wheel makes a deeper hole in trying to pull than in carrying a load on a dirt road.

Thus a traction engine that is of use on a hard, dry road is helpless as soon as it turns into a field.

A railroad locomotive on a steel rail will give a draw-bar pull of one fifth of its weight before the wheels slip. So it can go up an incline of about 10° without slipping if it does have to pull a load.

When a traction engine comes to an obstruction equal to 4 inches high the whole weight has to be lifted over that 4 inches. It is like climbing up an angle of 30 or more degrees. It needs a push equal to one-third the weight of the traction engine besides the axle friction and what load it is trying to pull, and on a soft road there is no momentum to a traction engine. So it is a dead lift that for the moment needs four or five times as much power as to travel along on a level.

Thus a good traction engine needs some ready way of temporally increasing its power a good deal.

To pull a load with a wheel, the wheel needs to be heavy to get a grip on the road to pull by.

If the wheel is light it revolves and digs a hole, so the chances are all in favor of its going down any way.

Measure a horses feet and he presses the ground with a flat surface at the rate of about 12 pounds to the square inch while a traction engine, allowing for how much of the wheel touches a hard road, bears on it 400 or 500 pounds to the inch.

When the earth is pressed by something flat the resistance of the earth to support a load increases with geometrical progression. If one square inch will hold up a pound, two inches square will hold up 16 pounds.

A foundation stone six feet square holds up the corner of a house.

Next comes the question of water supply.

A 20 horse-power needs 800 pounds of water an hour to feed an ordinary plug engine of that size. So a method of condensing by air currents is a great benefit. This we have done, at an expense of about 6 per cent. of the power, to produce a current of air sufficient to condense the steam.

Such an engine needs 8 pounds of water to one of coal. If it is stationary the coal costs more than the water. If it is traveling about the water often costs far more than the coal.

Thus it becomes a question what kind of an engine to use.

A single cylinder with a flywheel is the cheapest to build.

Two engines at right angles is better.

Best of all is two tandem engines, with two or even three cylinders to each. With three cylinders of right proportions you can take in your steam at 150 pressure and expand it down to nothing in the third cylinder. So you do not waste any power, you get a horse power out of 20 pounds of water per hour per horse power, instead of 40 in a small single cylinder engine.

And above all when you come to a hill or a mud hole, if you turn live steam into one of the larger cylinders, then you have three or four times the power for a short time to get up the hill just when you need three or four times the power, thus the extra cylinders are the source of great usefulness and economy. Add to this a method of condensing by a current of air and we have a machine very useful as long as we keep off soft ground.

We have not as yet got an explosive engine that will do as as well as the above, although we are working that way and we want it.

It should be one to use crude oil, that is one-third the cost of gasolene and not so troublesome by evaporation in the hot sun as gasolene is. We want a constant supply of air, a certain explosion every time (no hit or nip), the explosion to be stronger or weaker by the governor, according to the resistance of the road.

Three or four cylinders, so as to do away with as much flywheel as possible.

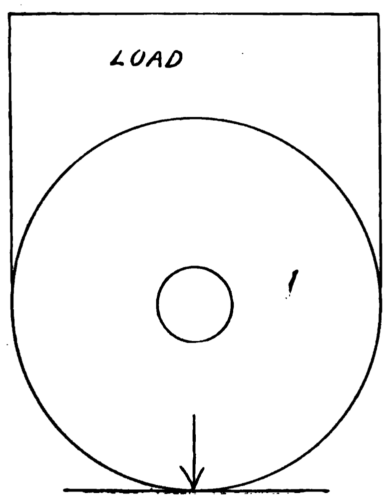
As to cooling water for the cylinder, after using a pound of water in steam through an engine there is still about 800 units of heat to take out of it to get it back to water again.

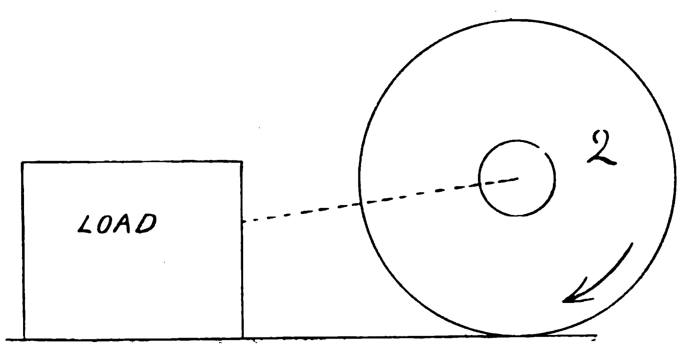
A gas engine will use as much or more water for horse-power than a steam engine, but it only puts about 100 units of heat into a pound of water. So it should be far easier to take out the 100 units of heat by an air current from the pound of water used by a gasolene engine than to take out the 800 from the pound converted into steam. Both have been done. It now remains to develop the best way of doing it.

Four pounds or 50 feet of air are equal to one pound of water (average temperatures) for cooling purposes. Such devices are bulky but not as heavy as carrying water.

G. H. Edwards.

Chicago, June 10, 1897.





A. T. Cross Steam Carriage.

A. T. Cross, of Providence, R. I., inventor of the Cross stylographic pen, who has been interested in the motor vehicle problem for many years, has built for his own use an experimental steam carriage, so constructed that other motive power can be substituted, if desired.

Three levers are used in controlling the vehicle. The operator sits on the right and handles either the steam or reversing lever with his right hand and steers with the left.

Altogether nine supporting springs are used, arranged on a three-point or triangular method so that no twisting strain comes on the two-inch angle steel frame to which the engines and boilers are attached. In order to lessen vibration the motive power and frame are suspended from the axles by spiral springs while the body and passengers are, in addition, supported by elliptical flat springs.

The designer, who has been a pioneer in the development of oil fuel, decided to use a high pressure steam boiler, heated by petroleum. It drives two one hp oscillating engines at 400 revolutions a minute to obtain a speed of 10 miles an hour. The boiler is of wrought iron and steel, tested to 300 pounds to the square inch; the engines are bolted to the steel water back; the cylinders are 2¼ x 2½. No link motion or eccentrics are used. Reversing the engines is accomplished by a slide valve, transposing the position of the exhaust and steam inlets, while the cut-off and lead are invariable. An extensive system of condensing pipes permits the feed water to be used repeatedly, and the fuel, oil and water are automatically controlled.

Two small atomizers, taking steam from the boiler, suck up the petroleum and drive it into the furnaces in the form of a fine spray. Two torches ignite this spray, and the flames produced rush round and among the boiler tubes. The amount of steam and petroleum used by the atomizers is regulated by a diaphragm and patented oil governor connected to the supply pipes. These regulators are actuated by the boiler pressure, and in this manner the fire is made to vary inversely as the pressure in the boiler and thus keep the latter constant. In other words, when the carriage stops, the fires are automatically extinguished, and *vice versa* are spontaneously relighted when the machinery moves.

The water in the boiler is maintained at the desired height by means of a float connected to a valve in the suction pipe of the pump; the latter is driven directly from the engine shaft. The exhaust steam passes through a feed-water heater and a number of inch and a half condensing pipes extending the length of the carriage, and the entrained water is caught by a lower tank, whence it is raised by a small pump to the upper tank, thus furnishing a gravity supply to the feed-water pump, which is in operation whether the carriage is running backward or ahead. Although the lower tank is open to the atmosphere, but little steam is perceptible at any time, owing to the ample condenser.

Under the Cross system of oil consumption, the waste gases are invisible, the supply of oil being automatically regulated to the quantity requisite for thorough combustion. The stack is flat, rectangular in section, and, following the lines of the buggy top, is unobtrusive.

Each supply tank contains 15 gallons of oil and water. About five gallons of oil is considered sufficient for a day's run. Kerosene can be procured from any country store and, though a trifle more expensive, may be substituted for the crude oil ordinarily used. With crude petroleum the carriage may be run at an expense of 1 cent per mile. As a portion of the water supply is lost in the spraying of the fuel, the feed water tank must be replenished from time to time; the tank capacity is sufficient for a five-hour run. The carriage weighs 1,800 pounds, with tanks supplied.

The steering rod is telescopic and the upright is placed close to the dashboard, out of the way; at the lower end of the vertical shaft is a small pulley, round which, and attached thereto, passes a chain connected to the forward wheels, which are pivoted close to the hubs. Commonly several adjusting screws and lock nuts are used to form the front wheel pivots, but by using an L shaped forging for the wheel bearings and welding an upright bearing on the ends of the square axle a very flexible pivot of the fewest possible number of parts was obtained, and one that cannot work apart or drop in pieces.

Before applying a differential gear of the Houldsworth or other common types, it was thought worth while, considering the high speed of the engines, to connect them by four belts to two countershafts; a fibre gear at one end of each shaft meshes into a brass internal gear, firmly clamped to each of the rear wheels.

Adopted as a tentative experiment in the first place, the inventor believes it good enough to retain. There is enough gain or loss in the belts at the high speed to permit the carriage to turn curves without noise or annoyance.

The design includes a powerful foot brake on band pulleys on two fast-running countershafts, but in actual practice it is found that the reversing lever will skid the wheels along a plank walk and is capable of considerable graduation in effect according to emergencies.

FOREIGN NOTES.

The French Government is contemplating the use of motor vehicles in the internal revenue service.

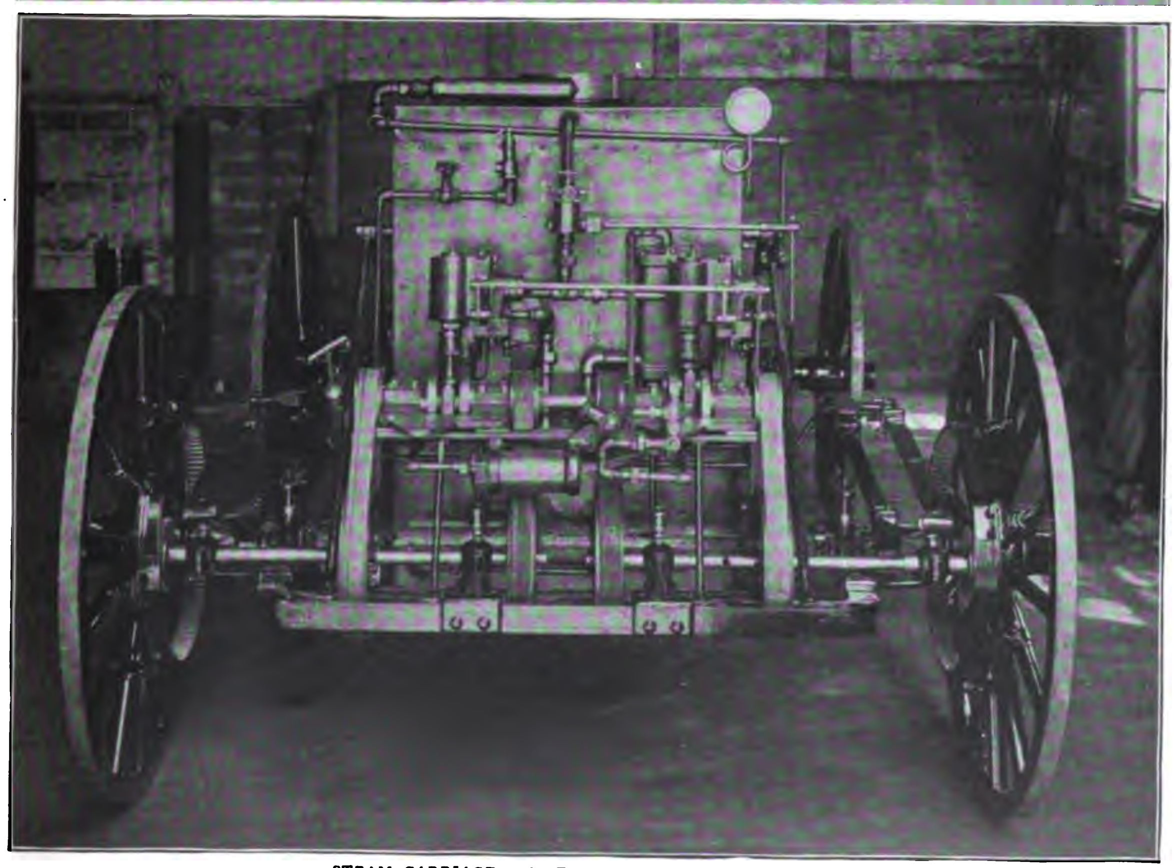
The representative French motor vehicle companies are unable to guarantee deliveries earlier than one year from date of order.

According to the *Autocar* the Daimler Motor Company, Limited, recently turned out five vehicles of various styles in one week.

A company called the motor Attachment Syndicate (Ltd.) has been organized in England to promote the Carmont motor and gear, which, it is claimed, can be successfully attached to any ordinary vehicle, the front wheels serving as both drivers and steerers.

The British Motor Syndicate are now supplying a very neat pocket case containing a glass gauge for testing the specific gravity of oil for use in petroleum engines. This should be a useful thing for any tourist to carry about, as if stranded in a country town he will have a means by which he can readily test the quality of any oil.

A proposal to increase the duty on motor vehicles was recently presented to the French Chamber of Deputies. The proposal contemplates a duty of 250f. under the general tariff, and 210f. under the minimum tariff for vehicles weighing less than 200k., of 180f. and 150f. for vehicles weighing from 200 to 500k., of 120f. and 100f. for vehicles weighing from 500 to 2,000k., and of 60f. and 50f. respectively for vehicles weighing more than 2,000k.



STEAM CARRIAGE. A. T. CROSS, PROVIDENCE, R. I.

The Palmer Gasolene Motor.

We give herewith an engraving of a new vertical gas and gasolene motor recently brought out by Palmer Brothers, Mianus, Conn., with a view to furnish the complete motor or castings with working drawings for amateurs and others desiring to construct one.

It is suitable for running light machinery when arranged as a stationary engine. The marine type (which is shown in the cut) it is claimed, will run a 16 or 18 foot boat or light motor carriage. It will run in either direction.

A pump is used to circulate water in the water jacket of the portable engine. In the stationary form a tank is used instead of a pump. This motor is built on the two-cycle compression

system, with an impulse at each revolution of the crank. It receives its charge and exhausts through a cylinder port opened and closed by the movement of the piston. A suitable valve regulates the charge received from the closed crank chamber in which the mixture is compressed by the downward stroke of the piston. Vapor and air are drawn into the crank case by the upward stroke o the piston and thoroughly mixed by the motion of the crank. The engraving shows the circulating pump, but the pipe leading from the pump to the water jacket is omitted.

The weight of the marine motor is 135 pounds; of the stationary, 200 pounds. The height of the stationary engine is 23 inches and that of the marine is 17 inches. The height from the base to the centre of the shaft is 4½ inches.

Consider your paper an excellent means of advertising. Sold four engines and in treaty for a number more.

SAN FRANCISCO, CAL. A. D. STEALEY.

The "Engineer" 1100-Guinea Contest.

The *Engineer* motor vehicle competition, which was set for June 1, and was to be decided by a run from Crystal Palace, London, to Birmingham and return, did not come off, as only seven vehicles were mustered at the preliminary exhibition, and the owners of all but one of these said they had no intention of undertaking the journey.

The exhibitors were: The Liquid Fuel Engineering Company of Southampton, Roots & Venables, the Yeovil Motor Car Company, the Electro-Motive Power Company, the Electric Construction Company and Holroyd Smith.

The Liquid Fuel Engineering Company showed a van propelled by steam power, the boiler and engine being the invention of H. A. House, Jr. The boiler is of the water tube variety, and is fired by means of a patent burner called the "Lifu," using kerosene oil. The oil is gasified before passing to the burner, the supply being automatically regulated by the head of steam. The working pressure is 250 pounds. The van is propelled by a pair of tandem compound engines, which when working compound give 10 horse-power, and when high pressure steam is admitted to all the cylinders, almost 20 horse-power. The van is designed to carry a normal load of one ton, and the cost of running loaded on ordinary country roads is estimated at 2*d*. per mile.

About two-thirds of the length of the van inside are available for passengers or goods. Under the floor are placed a pair of horizontal tandem compound engines, so small that they resemble models. They are beautifully made and running at 625 revolutions per minute, with a pressure of 250 pounds, give about 12 brake horse power. The crank shaft is geared about 2 to 1 to a countershaft, which is geared about 4 to 1 on the road wheels. Thus the carriage wheels make one revolution for about 8¼ revolutions of the crank shaft. Under the driver's seat, which extends across the front of the van, is a box, the seat forming the lid. In the box are two horizontal plunger feed pumps, driven by an inclined shaft and bevel gear from the first countershaft One of these pumps is spare. There is besides in the box a little horizontal double-acting steam donkey pump, for feeding the boiler when the van is standing. The driving wheels are turned round by toothed wheels of good size secured to the wood spokes. These wheels are enclosed in cases, so made that it is claimed that no dirt can get in. The engine, all the gearing and every portion of the mechanism is readily accessible.

Steam is generated in a tubular boiler, a sectional view of which is given in the accompanying cut. The drawing explains itself to any one who has ever seen a water-tube boiler of the Thornycroft or Normand type. The tubes of solid drawn copper are not rolled in, but are fixed by a patented screwed joint. The ends of the tubes are flanged after running nuts have been put on them, and these nuts are then used to force home the tube ends, copper to copper, and to make a joint; the boiler stands across the car, just behind the front seat. The water tanks serve as two longitudinal seats in the van. The steam drum is of Elmore deposited copper, and any tube may be taken out and replaced in a very short time. The arrangement for burning the petroleum is very ingenious. The oil is delivered into a "gasefier" over the flame, which serves to spread the flame and hot air. The oil is driven into this gasefier by the pressure of air maintained over its surface in the tank by a small pump worked by a handle at the driver's right hand. The petroleum vapor thus

produced passes down through a pipe to a conical burner, and the amount which issues is regulated by a tapered pin, the position of which is controlled automatically by the boiler pressure. The combustion produced is very complete, and the boiler makes at all times as much steam as the engines can use.

Roots & Venables exhibited two vehicles, a motor tandem, tricycle and a "petrocar."

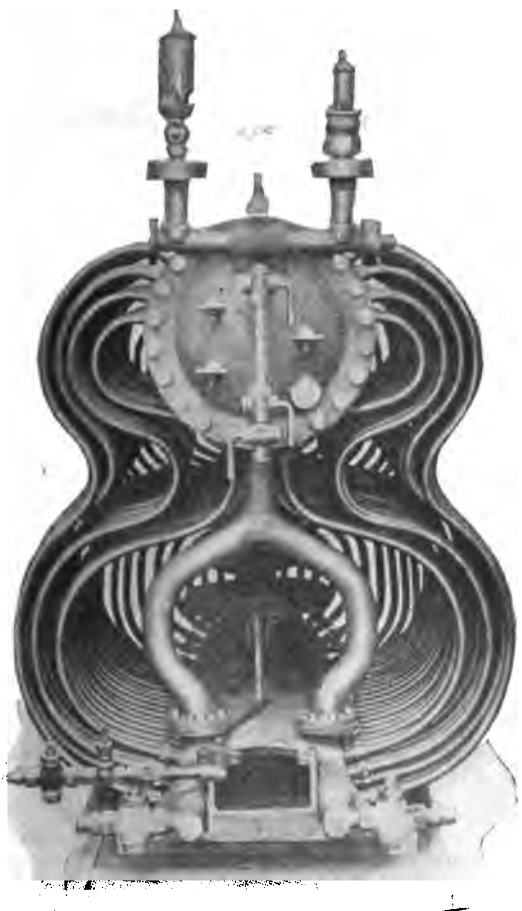
The Yeovil Motor Car Company had on view a two-seated carriage driven by a 2½-hp kerosene motor.

The Electro-Motive Power Company exhibited an electric phaeton, and the Electric Construction Company a cart for two persons.

Mr. Smith's vehicle was of the petroleum class.

The judges looked over the vehicles and after putting them through a number of evolutions, declared there would be no race. They commended the electric vehicle and the steam van, but had no word for the petroleum vehicles.

There were 72 entries, but the hard conditions laid down by the promoters and the lack of time to complete ideas debarred nearly all from competing.

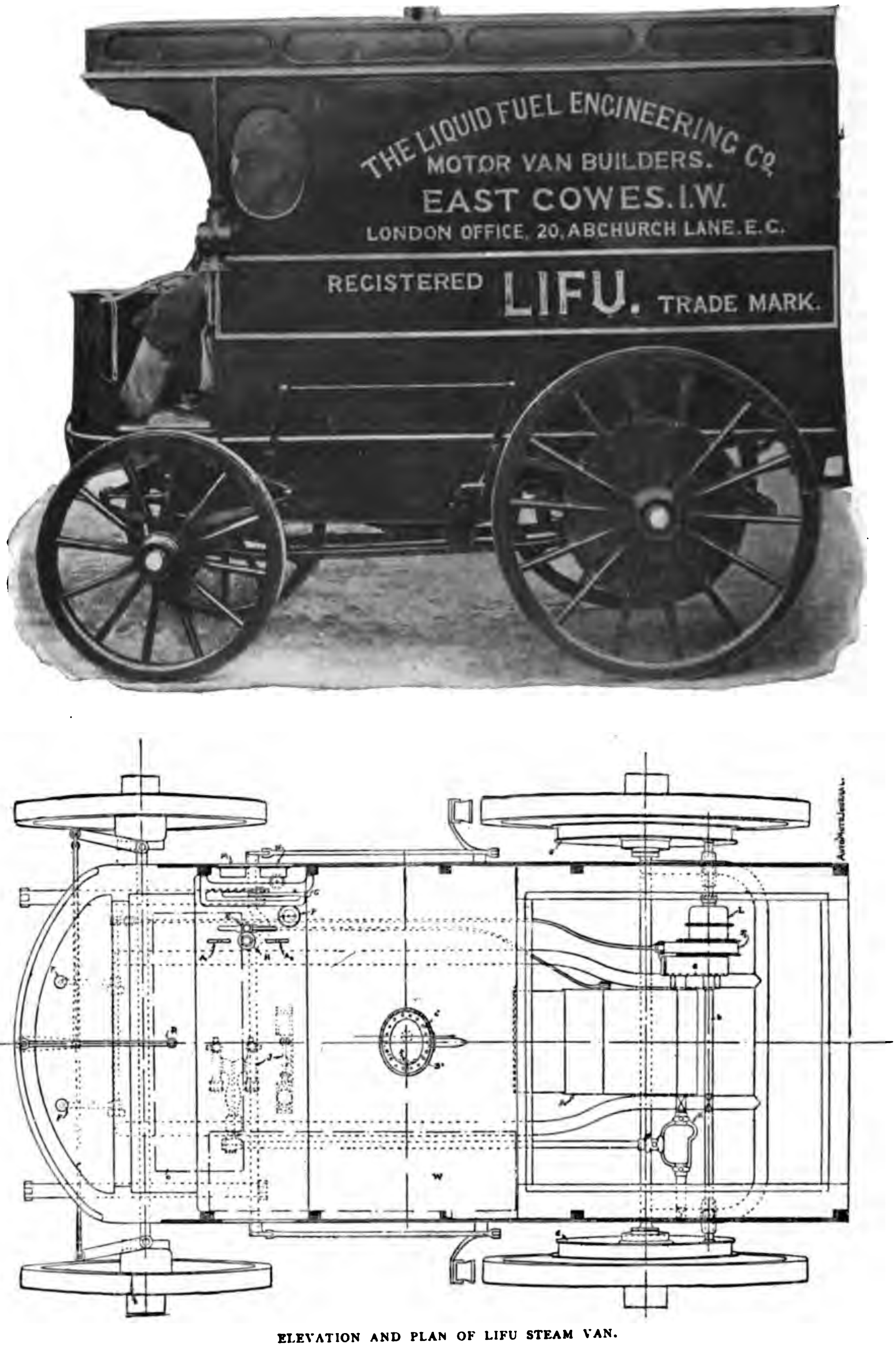


SECTIONAL VIEW OF LIFU BOILER.

HOLROYD SMITH GASOLENE CARRIAGE.

YEOVIL KEROSENE CARRIAGE.

BUSHBURY ELECTRIC CARRIAGE.



ELEVATION AND PLAN OF LIFU STEAM VAN.

Peugeot Horizontal Motor.

The new Peugeot motor is of the horizontal two-cylinder type, attached toward the forward part of the carriage to a cylindrical box forming a frame through which passes the motor shaft; at the back the cylinders are attached to a box that serves as a compression chamber and contains the various valves of the engine. The cylindrical frame at the front is made in halves connected on the axial plane of the cylinder, so that by removing the upper half, access is given to the mechanism; for the purposes of oiling and general inspection, a small opening is made in the upper half, closed by a sliding cover. Two other openings are also made in the sides of the box to admit air for cooling the cylinders. The same frame contains the bearing of the main shaft which passes through it, as shown in the illustrations. At one end of this shaft is a fly-wheel recessed, as shown in the section, Fig. 6, to receive the cone of a friction clutch for transmitting motion to the wheels through the gearing, the general arrangement of which is indicated in Fig. 3; at the other end of the shaft is a hand crank for starting the motor; there are two cranks made on the shaft at the same angle, an expansion cam *C*, and a centrifugal governor. As the whole of this mechanism is inclosed in the cylindrical frame, it can be easily maintained in a good condition of lubrication, and free to a considerable extent from dust. The gas is drawn into the cylinders through the inlet valves placed at the upper part of each cylinder; the exhaust valves are located beneath. By removing the cover at the top of the valve-box access is at once obtained, so that the valves can be adjusted or removed without interfering with any other part of the mechanism. The valve-box, together with the rear part of the cylinders, which is inclosed in a jacket, is cooled by a circulation of cold water.

The method of exploding the gas charges need not be described, as it is practically the same as that used in the older type of motor employed on the Peugeot carriages. The illustrations show that the firing device is placed on the back of the box at the rear of the cylinders; it contains two igniting tubes communicating respectively with the space between the two valves of one cylinder. These tubes are maintained at a suitable temperature by two oil burners; the lower part and the controlling tap are seen at the bottom of the lantern, Fig. 5, in which the air admitted to the carbureting chamber is heated.

By reference to the various illustrations it will be seen that beneath the motor and parallel with its longitudinal axis is a shaft running from end to end. At the front end where it enters the cylindrical box it carries a lever which is made with a slide at the upper end. This slide *K* engages in the groove of the cam *C*, of which a side view is given in Fig. 8. An angular movement is imparted to it by this arrangement, giving to the distributing shaft a partial rotation. This oscillation is transmitted to the inverted Λ-shaped piece keyed to the rear end, and seen clearly in the perspective view of the motor, Fig. 4, almost beneath the lantern containing the burners. Each branch of this Λ-piece, of which a separate view is given in Fig. 7, has a small lever articulated to the end, which lifts the exhaust valves at the proper moment, the arrangement being such that the Λ-piece can only lift one exhaust valve at each revolution of the motor. By this arrangement the explosions are successive, and there is one to each revolution of the motor.

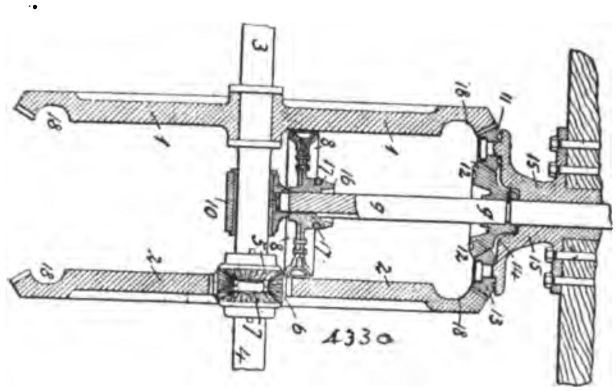
If the speed becomes excessive, the centrifugal governor already referred to overcomes the resistance of the spring *R* placed at the front end of the distributing shaft and coiled around the extension of the block *D*. This block is then pushed back by means of bent levers, shown in the illustrations, and couples with a piece T-shaped in plan, that is placed above the arms of the small levers articulated on the branches of the A-shaped lever already described. As the small levers are held up by springs, they yield under the pressure created, and in their movements affect the normally straight arms that actuate the exhaust valves; these arms then pass on one side of the valve rod, and the exploded charge not being able to escape, there is no new admission. An explosion being thus missed, the speed is immediately reduced, and with the reduced movement of the governor all the various parts resume their normal positions.

We think that with the aid of the illustrations the very ingenious details of M. Peugeot's new motor will be understood from the foregoing description; the mode of transmitting the power to the wheels is indicated in the engravings, and, besides, does not differ essentially from the former types of the Peugeot carriage which we have already dealt with.—*Engineering*.

The Rowbotham Transmission.

There are two sets of conical gears, 1 and 2, one of which is mounted loose, while the other is fastened upon the axle of the driving wheels. This axle is in two parts, 3 and 4, connected by the differential gear, 5, 6 and 7. A friction roller, 8, placed between the two .... 1 and 2, slides upon the motor shaft, 9, and carries the toothed wheel, 10, mounted loose, which by means of the pinions, 12 and 13, engages with 1 and 2.

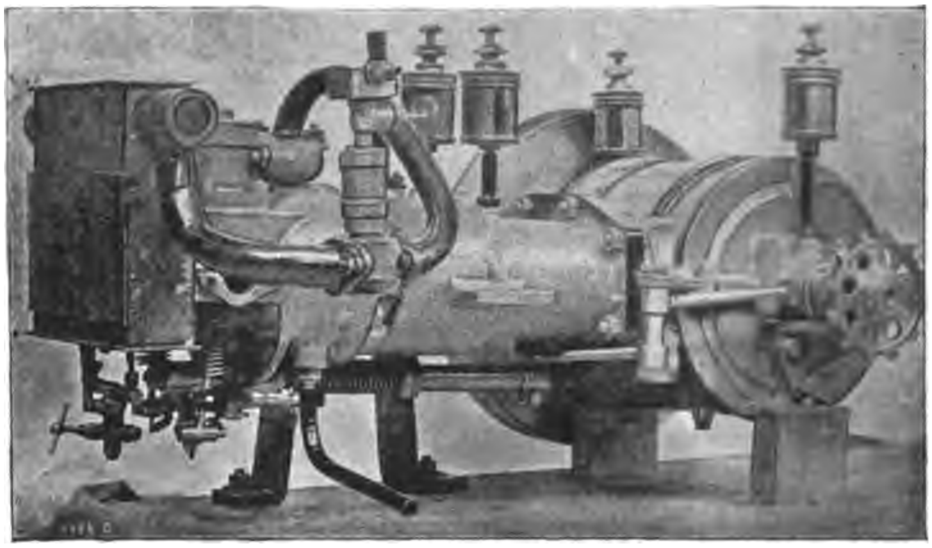
The motor transmits directly to the shaft, 9, which carries the plate, 8, at a constant speed of rotation. The speed of the

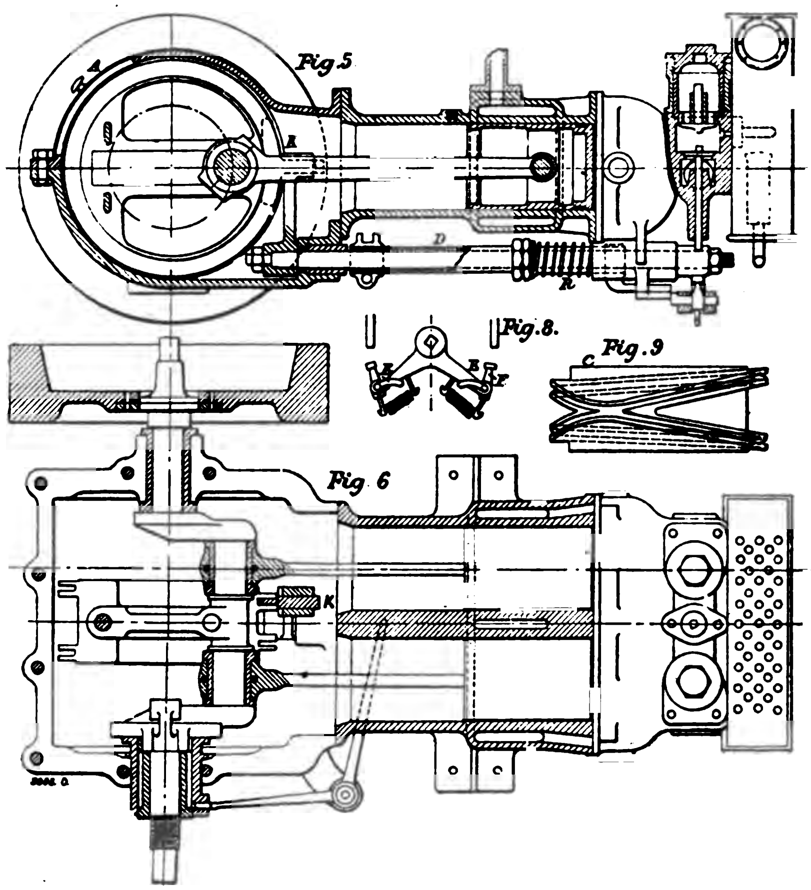


vehicle can easily be varied by changing the position of the friction roller, 8. The further it is moved from the axle, the slower the speed; the nearer it comes to the periphery the greater the speed of the vehicle.

When 8 reaches the groove 18, the machinery will be thrown out of gear and the cone 16–17 will enter the corresponding groove of the piece 12. Motion will then be communicated to the plates 1 and 2 by means of the pinions, 11 and 13, which give reverse motion.

Hence all speeds from 0 to maximum are obtained at will as well as reverse motion.





PEUGEOT HORIZONTAL VEHICLE MOTOR.

Recent Gas Engine and Motor Patents.

584,097. *Hydrocarbon Motor.*—Martin H. Rumpf, Brussels, Belgium. Filed Sept. 9, 1896. Serial No. 605,221.

584 127. *Motor Vehicle.*—Edmond Draullette and Ernest Catois, Paris, France. Filed Oct. 5, 1896. Serial No. 607,883. Patented in France Aug. 21, 1896, No. 259,059.

584,130. *Gas Engine.*—Frederick C. Griswold, Port Jefferson, N. Y., assignor of one-half to Martin L. Chambers, same place. Filed Nov. 25, 1896. Serial No. 613,367.

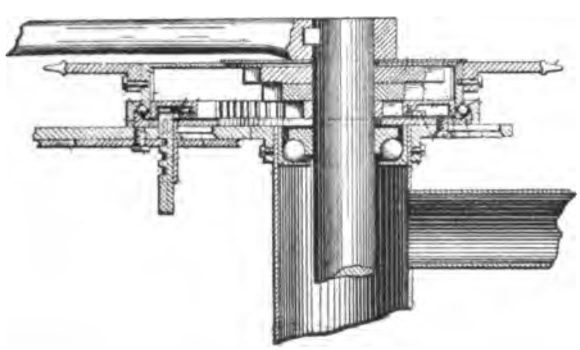
584,169. *Vehicle Motor.*—George M. Stock, Milwaukee, Wis., assignor of one-half to Mathias Schneider, same place. Filed Jan. 21, 1897. Serial No. 620,107.

584,188.—*Gas or Vapor Engine.*—Presley B. McLelland and Stephen D. McLelland, Chicago, Ill. Filed Dec. 20, 1895. Serial No. 572,816.

584,282. *Gas Engine.* — Franz Burger and Henry M. Williams, Fort Wayne, Ind. Filed Aug. 1, 1894. Serial No. 519,205.

584,349. *Process of Carbureting Gas.*—Arthur B. Griffen, Verona, N. J., assignor to the Gilbert & Barker Manufacturing Company, Springfield, Mass. Filed Jan. 22, 1895. Serial No. 535,770.

584,377. *Changeable Gear for Vehicles and Driven Mechanism.* Frank H. Lefroy, New York, N. Y., assignor to Francis H. Richards, Hartford, Conn. Filed March 13, 1896. Serial No. 583,106.



Claim.—In a changeable gear for driving mechanism, the combination with a frame and a shaft, of a multogear on the shaft, a drum surrounding the gear and of a diameter greater than the gear, a support on the frame, a slidable disk on the support, a bearing connection between the drum and disk, an internal gear loosely mounted on the interior of the drum, means for moving the drum, disk and gear transversely of the shaft, means for moving the internal gear longitudinally of the shaft and independent of the drum, and means for closing the drum against the ingress of dust, substantially as described.

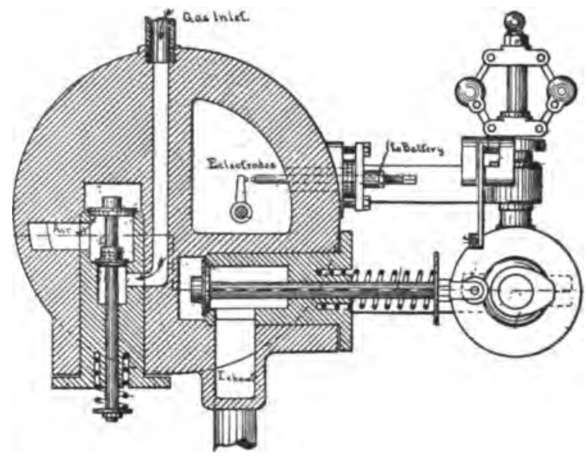
584,402. *Belt Take-Up for Speed Varying Mechanism.*—Milton O Reeves, Columbus, Ind., assignor to the Reeves Pulley Company, same place. Filed Jan. 11, 1897. Serial No. 618,752.

584,408. *Mechanical Movement.* — Henry K. Sandell Chicago, Ill. Filed April 12, 1897. Serial No. 631,820.

584,448. *Gas Engine.*—Cornelius C. Wright and William J. Stephens, Titusville, Pa., said Wright assignor to said Stephens. Filed Sept. 8, 1896. Serial No. 605,144.

584,500. *Steering Device.*—Robert Galloway, Buffalo, N. Y. Filed Sept. 28, 1896. Serial No. 607,187.

584,622. *Gas Engine.*—John O. Brown, Dayton, O., assignor to Allie M. Brown, same place. Filed Oct. 24, 1895. Serial No. 566,688.



Claim.—In a gas engine, the combination with an exhaust-valve, a governor and a bell-crank lever operated by said governor, of a horizontally-reciprocating rod connected to the lower arm of said lever, downwardly-projecting shifting bars 36 and 37 mounted on said reciprocating rod and subjected to a common movement thereby, an igniter-rod adapted to be periodically supported by one of said bars, and the exhaust-valve adapted to be periodically supported by the other of said bars and cams mounted on a common shaft and adapted to actuate said bars, substantially as described.

584,809. *Variable Throw Crank.*—Alfred Anthony, Colchester, England. Filed Nov. 23, 1896. Serial No. 613,230. Patented in England Oct. 14, 1896, No. 22,829.

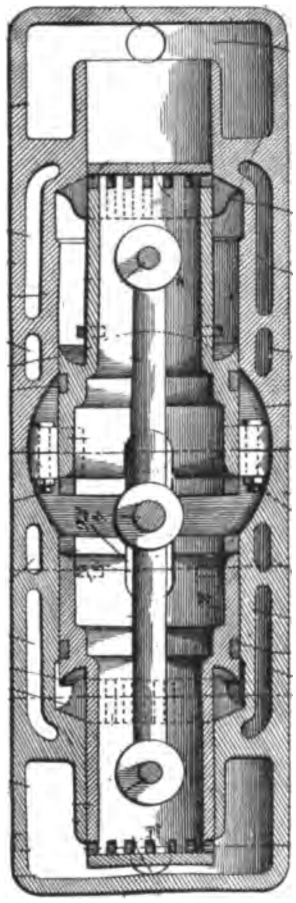
584,960. *Explosive Engine.*—Charles Quast, Marion, O. Filed Sept. 5, 1894. Serial No. 522,179.

584,961. *Gas Engine.*—Charles Quast, Marion, O. Filed Nov. 6, 1894. Serial No. 528,115.

584,666. *Motor Vehicle.*—Amédeé Bolleé, Fils, Le Mans, France. Filed Aug. 7, 1896. Serial No. 602,004.

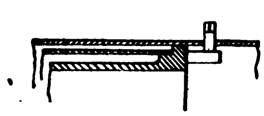
584,674. *Gas Engine.*—Edward B. Dake, Muskegon, Mich. Filed April 17, 1896. Serial No. 588,026.

Claim.—In a gas-engine, the combination with a driven shaft of explosion-cylinders arranged radially with relation to said shaft, pump or suction cylinders arranged in coaxial alignment with the explosion-cylinders, operating pistons connected with said driven shaft and operating in the explosion-cylinders, said pistons being provided with reduced hollow extensions forming plungers operating in the pump or suction cylinders and provided at their outer extremities with inlet-ports, and compression-chambers arranged in terminal communication with the pump or suction cylinders, the inlet-ports of the plungers being adapted to communicate alternately with the compression-chambers and the explosion cylinders, substantially as specified.



584,921. *Fastening for Cylinders and Explosion Chambers of Petroleum Motors.*—Emil Capitaine, Frankfort-on-the Main, Germany, assignor to George T. Harris, Philadelphia, Pa. Filed Nov. 7, 1896. Serial No. 611,329.

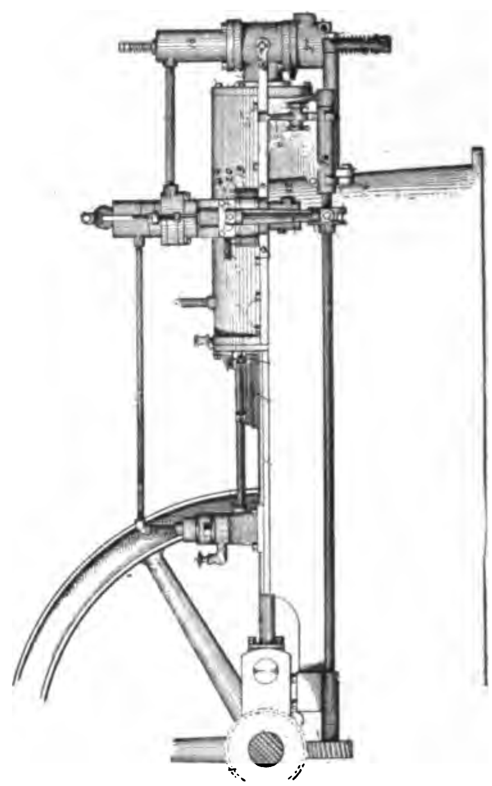
1. In engines of the character described, the combination with a sheet-metal case or housing, a cylinder mounted therein, and a jacket between said case or housing and the cylinder and arranged to form a cooling chamber around the latter, of an explosion head or cover adapted to register with the open end of the cylinder and held in position in one direction by an inward projection on the case or housing and in the other direction by adjustable means tending to force the cylinder against said head or cover, substantially as described.



585,115. *Gas Engine.*—Charles A. Miller, Springfield, O., assignor to the Miller Gas Engine Co., same place. Filed Jan 6, 1896. Serial No. 574,491.

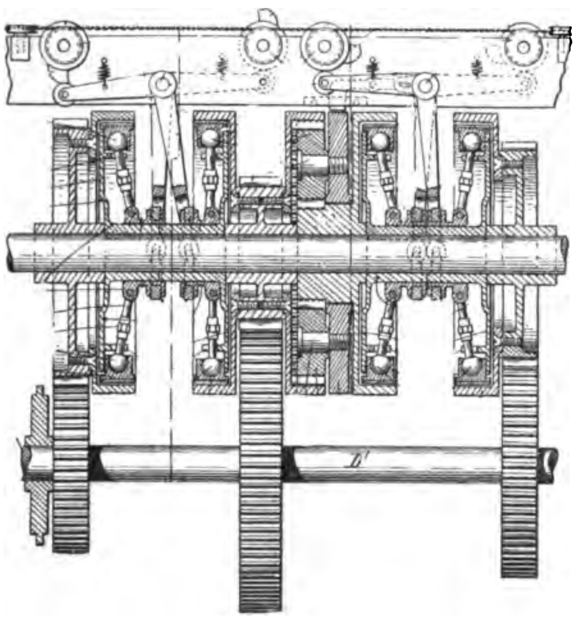
The principal feature of the invention consists of a pneumatic or atmospheric pressure governor.

The second feature consists of a cylinder and water jacket constructed in separate and distinct pieces instead of in one piece, as heretofore. This change is claimed to bring about new and improved results—to wit, it first enables the builder to thoroughly inspect the exterior of the cylinder with the view of finding any flaws or defects, as a result of casting, which cannot be done under the old construction. The second advantage is that where hard water or water containing lime in suspension is used in the water jacket, the cylinder can be removed and the incrustation which the heat causes to form thereon and in the jacket can be removed.



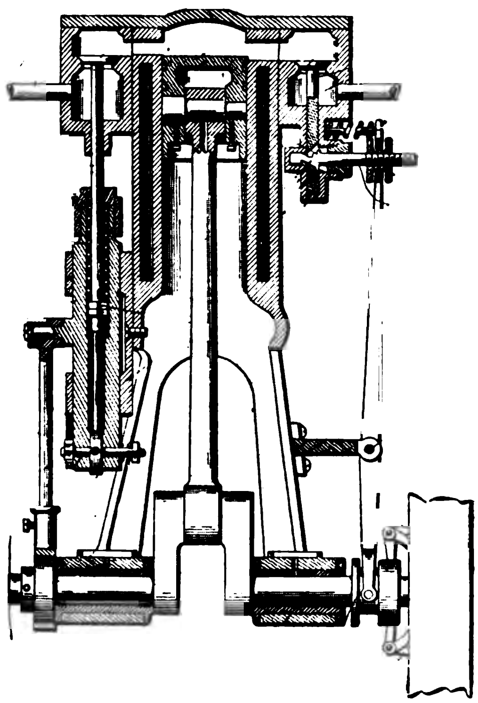
585,159. *Motor Vehicle.*—James F. Duryea, Springfield, Mass., assignor to the Duryea Motor Wagon Co., same place. Filed Nov. 7, 1896. Serial No. 611,370.

Claim —In a motor-carriage or other automobile conveyance, a motor, a driving shaft connected to said motor, a counter shaft having a suitable connection with the driving axle of said carriage, a series of loose gears on said driving shaft and fixed gears on said counter shaft in mesh with said loose gears, clutch mechanism on said driving shaft for engaging said loose gears for rotating said counter shaft at various speeds in one direction, and means on said driving shaft for rotating said counter shaft in the opposite direction, consisting of an internally toothed flanged pulley, secured to the side of one of said loose pulleys, a friction driven pulley, a gear on the hub thereof a yoke having pinions thereon, said yoke having a bearing on the said hub of pulley, a clutch mechanism for engaging and rotating said pulley, a cam-operated clutch lever for operating said clutch mechanism, and means actuated by said clutch lever for engaging the said yoke and preventing



the rotation thereof during the rotation of said pulley, combined with means for operating said cams, substantially as described.

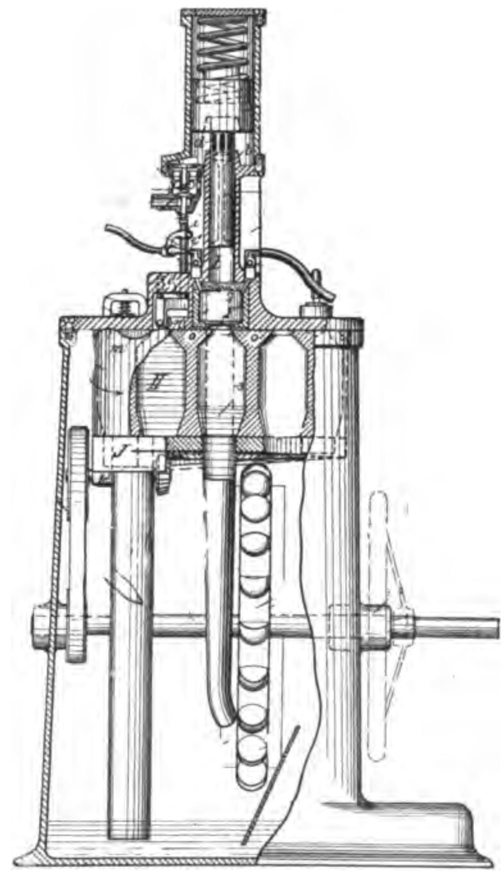
585,127. *Explosive Gas Engine.* George W. Starr and John H. Cogswell, Havana, Ill. Filed Aug. 26, 1896. Serial No. 603,991.



Claim.—A device for regulating the supply of gas to a cylinder of an explosive gas engine, consisting of the valve stem slotted longitudinally, the steel beveled block held therein, combined with the shaft having the under side of its head beveled and an integral step thereon, the outer end of the said shaft being screw threaded, the adjusting nuts having hubs mounted on the screw threaded portion of the shaft, and the pivoted lever having a slot near its upper end through which the said shaft passes, and the spring interposed between the upper end of the said lever, and the casing carrying the valve rod, the lower end of the lever being connected with a collar which is moved backward and forward by a governor, substantially as shown and described.

585,601. *Gas Engine.*—Herbert B. Steele, Malden, Mass. Filed Dec. 10, 1895. Serial No. 571,628.

The inventor seeks to lessen the loss from radiation by making the time during which the loss can occur, and which is determined by merits of moving parts and by the load, much shorter than heretofore by divorcing at that time the motor

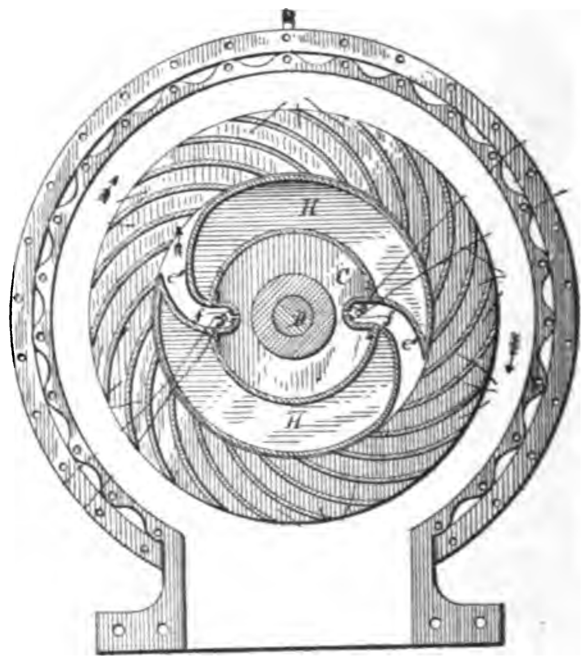


piston, that is, the piston by which the power is developed, and which, as hereinafter recited, is composed of a liquid, from all mechanical connection with the other parts of the engine, so that at the time of expansion of the charge it becomes a body free to move and subject to such of the laws of motion as refer particularly to the relation of its mass (mass of the motor piston) to the applied force (force of the exploding charge), so that the explosive force of the charge is entirely

taken up in giving velocity to the piston and that the energy of the charge for an assignable time and space previous to its transformation to useful effort is entirely stored in the piston in the form of kinetic energy. As the piston is a free body and its velocity governed by the relations of its mass to the force of the explosive charge, by changing these relations the velocity of the piston and consequently the duration of the time in which the loss can occur may be made brieter and the loss therefore smaller than heretofore without the necessity of encountering the difficulties attendant upon greatly increasing the speed of the machine, and he still further lessens this loss from radiation by lessening the difference in temperature between the gases and their inclosing wall at the time this loss is most serious, and by providing separate chambers for the different stages in the use of the gas and advancing the gas stage by stage from one to the other, so that the walls may be of a temperature appropriate to their individual use and so that the combustion chamber, where this loss is most felt, may be allowed to accumulate heat till the difference between it and the gases is much smaller than at present, and because of the separation without danger of communicating heat to the gases prematurely and losing power as existed heretofore, and he seeks to lessen the frictional loss by taking the power for compressing directly from the exploding gases by a separate piston from that utilizing the expansion for driving the load, which is integral with the compressing piston, and placing this preferably in a vertical position, by which its own friction is minimized, and by which I save all frictional loss due in the present style of engine to storing this power for a time and transmitting it to and fro.

As it is desirable that the pistons or bodies of matter should move forward and perform their office of absorbing the power of the expanding gases with great rapidity, a velocity much higher than that at present in use is attained by them, and as these pistons must be brought to a stop in order that they may yield up the power they have absorbed in useful work on the load, and in order to avoid the great shock and accompanying noise and wear upon any positive mechanism for bringing a solid piston to rest, he makes them of some liquid, as water; and that sufficient time may be allowed to permit the use of the waste gases by condensing them, and that the piston-chamber be cleared of the products of combustion and the pistons be returned back to their original height without deducting from the useful time of the machine, I use a number of piston-chambers embodied in a translating device, so that while one is in action the others are being prepared at another place; and as he makes the operations of returning the pistons to the original height, discharging the burned gases, and translating the pistons into place continuous the result is a continuous succession of pistons to be acted upon by the exploding gases and be driven by them in one direction through the machine; and as the number of chambers in the translating device may be large enough to afford adequate time for cooling the contained waste gases and the channels leading the liquid to them may be of sufficient size the number of new pistons used in a given time may be as large as desired; and as the compressing is done by a direct-acting poston, governed in its time only by its weight and the electric force of its cushion spring, any number of charges of compressed gas may be delivered to the combustion-chamber. As the number of charges and the number of pistons are not limited, any required number of motor strokes may be made per unit of time, giving the utmost facility for regulation; and he claims to overcome the difficulty of insufficient expansion in the existing class of engines by providing other chambers for the operations heretofore imposed upon the expansion chamber—namely, compression, admission, and discharge of gas—and remove the restrictions of fixed stroke by having the piston free and arranging the mechanism so that the pistons go through the expansion-chamber from end to end in one direction and never backward; and being thus free of restrictions he makes the expansion-chamber of sufficient size and shape that the expansion may be carried to atmospheric pressure, thus saving a large amount of power heretofore thrown away.

585,230. *Gas Turbine.*—James G. Sanderson, Scranton, Pa. Filed March 6, 1896. Serial No. 582,079.



Claim.—In a gas-turbine, the combination of a suitable casing, a turbine wheel mounted in said casing, a series of explosion-chambers secured to said casing, suitable valves arranged in said chambers and adapted to be moved to admit gas and air into the said chamber, and suitable means for exploding the mixture consisting of a contact-point, having connection with an electrical supply and carried by the valve and a second contact also having connection with the electrical supply carried by the casing and which is momentarily engaged by the first contact when the valve is moved to close position so as to create an electric spark for exploding the mixture, substantially as shown and described.

585,251. *Motor Vehicle.*—Henry R. Bird, Buffalo, N. Y. Filed Jan. 4, 1896. Serial No. 574,343.

Claim.—In a motor-vehicle, the combination with the framework, an engine mounted thereon, a shaft parallel with the side beams of the frame and driven by the engine, and a disk secured to the front end of said shaft; of collars surrounding the side bars of the frame in front of the disks, bearings pivoted to the collars, a second shaft journaled in the bearings at right angles to the first shaft, a friction-wheel feathered on said second shaft, means for adjusting the frictional contact

of the disk and wheel, a rack, arms projecting rearwardly therefrom and surrounding the driven shaft on either side of the friction wheel and in close proximity thereto, a gear-wheel meshing with the rack, and connections between the second shaft and the wheels of the vehicle for propelling the same, substantially as described.

585,371. *Motor Vehicle.*—Clinton E. Woods, Chicago, Ill., assignor to the American Electric Vehicle Company, same place. Filed May 8, 1896. Serial No. 590,710.

Claims—1. A steering device for vehicles containing a rotating bar, a handle eccentrically secured to said bar, and a spring which tends to draw the handle from the bar so that the eccentric portion is frictionally forced against a platform to frictionally lock the parts in any desired position.

2. A steering mechanism for vehicles containing a vertical rod, a platform which surrounds one end of it, a handle eccentrically pivoted to the same end of said rod outside of said platform, a spring on the opposite side of the platform which tends to draw the rod away from the handle.

3. In a vehicle, the combination of a fixed axle with a short horizontal vertically-pivoted axle at the end, an arm projecting from the same, a steering connecting-rod attached to said arm and a step also attached to said arm.

4. In a vehicle the combination of the rigidly-fixed frame with a motor secured thereon at one end so as to have vertical and longitudinal motion and pivoted at the other end.

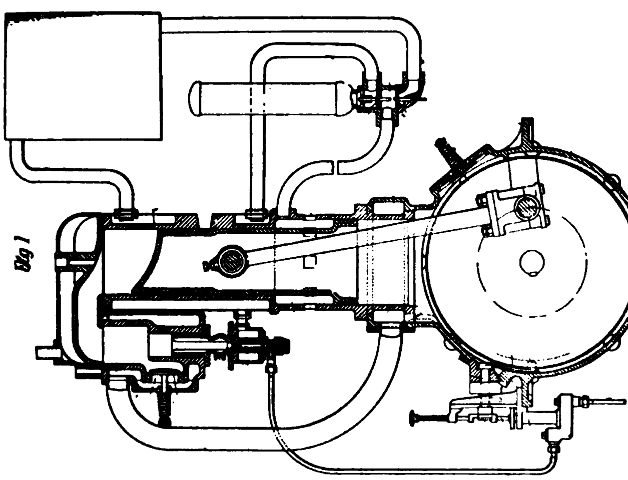
5. In a vehicle the combination of a rigidly-fixed frame with a motor secured thereon at one end between springs and so as to have a longitudinal motion and pivoted at the other end.

6. In a vehicle the combination of a rigidly-fixed frame with a motor suspended at one end on a longitudinally-adjustable pivot and at the other end on a spring-support.

7. In a vehicle the combination of a rigidly-supported frame with a motor secured thereon at one end by longitudinally-adjustable pivots and at the other end between springs and so as to have a longitudinal motion.

8. In a vehicle the combination of two motors with separate braking devices, a single brake-controlling device and an evener or equalizer whereby the one controller is connected with the two brakes.

585,434. *Explosive Engine.*—William E. Gibbon, Colchester, England. Filed Oct. 24, 1896. Serial No. 609,946.



Claim.—In an explosion engine the combination of a differential piston and cylinder, a closed crank-chamber, a valve for admitting air into the said chamber, an opening or openings from the outer air through the cylinder into the chamber uncovered by the piston when at about the end of its instroke, and a passage for conducting the air compressed in the chamber into the combustion-chamber, substantially as described.

585,504. *Gas Engine.* Lewis S. Brown, Columbus, O. Filed Oct. 22, 1896. Serial No. 609,686.

Australasian Patents.

Messrs. Phillips, Ormonde & Co., Consulting Engineers, Patent and Trade Mark Agents, 169 Queen Street, Melbourne, Victoria, Australia, supply us with the following specially prepared list of applications for letters patent in Australasia in connection with motor vehicles and the like:

E. B. Tree, of 622 Princess Street, Woodstock, County of Oxford, Province of Ontario, Canada, and R. H. Eldon, of 343 Clinton Street, Toronto, County of York, Ontario, aforesaid, for "Rotary engines."

A. Manesdorffer, of Dally Street, Northcote, Victoria, and E. C. Elliott, of 377 Collins Street, Melbourne, Victoria, for "Improved mechanism for transmitting and increasing the power in rotary and other motion, also applicable to other purposes."

J. V. Hunt, of 314 Post Office Place, Melbourne, Victoria, for "An improved tire for velocipedes, bicycles, vehicles and the like."

C. F. C. Lohmann, of 13 Andrew Street, Northcote, near Melbourne, Victoria, for "An improved rotary motion to be driven by steam or other motive fluid."

W. Radford, R. A. Tucker and R. H. Singleton, all of Dimboola, Victoria, for "An improved horseless vehicle."

A. J. Cumming, of Christchurch, Canterbury, New Zealand, for "Means for preventing puncture of pneumatic tires."

L. Schmoll, Jr., and E. Schmoll, both of 71 Cathedral Square, Christchurch, Canterbury, New Zealand, for "Improved friction driving mechanism for cycles and similar vehicles."

New Gas Engine Cycle.

According to the London *Electrician*, Tremlet Carter has worked out the details of a new gas engine cycle, the principle improvements in which over the Otto cycle are described as follows:

(1) The useful recovery of heat wasted in the jacket and the exhaust, which in the Otto cycle is represented by some 70 to 80 per. cent. of the total beat; (2) the abolition of the idle revolution, without the use of two working cylinder ends, and without the use of a pump for compressing the explosive mixture; (3) an increase in the power obtained from a given-sized cylinder; (4) prompt and efficient regulation without omission of explosions; and (5) a means of increasing the power of the engine considerably beyond the normal, to enable it to take extra heavy loads for short intervals. The consumption of gas by an engine working on the new cycle is expected to be from 50 to 60 per cent. only of the gas consumed in the Otto cycle, the thermal balance-sheet showing a thermodynamic efficiency of 40 per cent. for engines of moderate size

Sir David Salomons on Motor Traffic.

On May 12, Sir David Salomons, president of the Self-Propelled Traffic Association, read a paper on "Motor Traffic" before the Society of Arts, of London, England, which is worthy of extended notice.

After a brief preface dealing with the general tenor of previous literary work on this subject, the eminent lecturer proceeded as follows:

(1) How few patents taken out recently in connection with the subject are original.

(2) How the whole tendency of the construction of light vehicles gravitates to the better types of those in existence between the years 1820–30.

We, of course, possess an advantage over the constructors of that period, inasmuch as we have improved materials to deal with, and can therefore produce a better kind of engine and boiler in the case of steam. Much surprise has been expressed by the uninitiated, not even excepting many engineers, as to the reason why the horse power to be carried on the motor-propelled vehicle should be greater than when the living horse is employed. I will examine this question first. You will fully realize that if carriages had wheels no larger than the ordinary reel of cotton, the usual obstructions to be found on highways would generally be as high or higher than the diameter of the carriage wheels; so that when the obstructions were met by the wheels, if the former were loose, they would be pushed along, and if fast progress would become practically impossible, and the wheels would be destroyed or wrenched off before the vehicle had proceeded many yards. On the other hand, if the wheels were to be, say, 30 feet in diameter, even considerable obstructions on the road would not be materially felt, as the wheels would pass over them with the utmost ease. In practice such large wheels could not be used. I will therefore suppose that the usual diameters as generally seen on carriages are employed when dealing with this subject, so that the wheels are from, say, three to five feet in diameter. We all know why, thanks to the careful investigations of the late Mr. Froude and others, the fish moves with such freedom in water when it is completely immersed, the reason being that the power necessary to divide the water in advance is compensated by by the closing of the water behind the fish, which gives it a push. Its curved outline is so admirably formed that the fish is capable of moving through the fluid in which it lives with virtually nothing more than skin friction to be overcome. The same might be thought to take place in the case of a carriage rolling along a rough road—*i. e.*, the extra power required to get the wheels over an obstacle should be compensated for by the downward run when descending the other side. To some extent the theory would hold good for exceedingly rapid motion, but not for speeds permitted on high roads, and for the following reasons: It is evident that a wheel, in surmounting an obstacle, rises gradually, but it descends through a less distance as a rule, because the obstacle, a stone for instance, has probably been sunk into the ground or broken smaller by the wheel's passage. But supposing no crushing action takes place, as might well be the case with a very light vehicle, then why should the work be harder to pull it over a rough than a smooth road? The answer is, that in passing over a rough road, the speed being slow, the sum of the pulls necessary to get over the obstructions is far greater than the sum of the accelerating forces on descents, owing to the tendency of the wheel to push into the ground before surmounting the obstacle, and this applies in all cases. If the obstructions on a highway consisted of a series of symmetrical waves, switchback in form, it is clear that the carriage would run slowly up an incline, and more quickly down. The average power used, supposing these undulations to be on an otherwise good road, would be no greater than had these undulations not existed, although the carriage would have advanced by fits and starts. In giving these various explanations I have assumed that the horse is drawing the vehicle, and the line of draught is therefore at a point somewhat higher than that of the axles—in other words, inclined backward to the road, which is a great advantage, because the pull tends to lift the wheels over the obstructions. Supposing, now, we place the horse behind the cart and make him push it with his chest, what would be the result? The wheels, instead of being assisted in surmounting obstructions by the lifting tendency, would now tend to drive themselves into the ground behind the obstruction, and the horse, which might have advanced with the greatest of ease when placed in front, would have his work cut out to push the cart from his new place. Here we have the condition imposed upon a self-propelled vehicle. This difference between dragging and pushing is well shown in the case of a railway-truck on which porters move passengers' luggage. If the truck, when loaded, meets with an obstruction, the only way to advance easily is turn round and pull it along. I should like for a moment to consider the manner in which the power is derived from the horse. Of course, we must all admit that primarily it is muscular action, but most people think that a horse advances solely in consequence of the anchorage obtained on the road by means of its feet, whereas there is another very important action brought into play, which those who watch these animals carefully will easily observe. It is well known that a heavy horse can drag a greater load than a light horse, and I think, when you consider the special point to which I will refer, the reason is very obvious, although of the two horses in question one need not have greater muscular power than the other. Riders are aware that during a trot, and indeed at all times, the body of the horse rises and falls. The rising of the horse is due to muscular power exercised against gravitation, whereas the fall is due to gravitation alone. Since the horse is advancing during the time a curve of a wave-shaped form would represent graphically the rise and fall of the horse's body. It, therefore appears evident that there is during half the period of advance a time when gravitation materially assists the progress of the vehicle, and the greater the weight of the horse the more it will be in favor of the load being pulled. Consequently, the heavy horse has an advantage over the light one for heavy loads. It appears to me that this, what I would term undulatory advance, is in a large measure equalized by the spasmodic advance, due to the horse's feet pushing against the road, and here is to be found one of the chief reasons why the carriage runs with smoothness. No motor has ever yet been devised combining these two properties. Gordon and others invented vehicles with feet to imitate the progress of the horse, but the rising and falling of the heavy weight was absent in these devices, and may possibly have been the reason why they proved complete failures. It may readily be imagined how jerky the advance would be without this compensating governor.

PNEUMATIC TIRES.

A few words respecting pneumatic tires are not out of place. An ideal road would be one of a hard elastic surface capable of permitting all inequalities to sink into it without friction, when

the wheels meet any obstruction lying upon it. Such a road in practice cannot exist. It is necessary, therefore, to seek a means which will produce the same results. A pneumatic tire, suitably constructed, will give the equivalent of the ideal road, *i. e.*, the obstructions which the tire meets will sink into it, and the traveling load will not be raised against gravity. Losses by friction, however, remain the same. The advantages to be derived from the use of the pneumatic tire cannot, however, be gained except by encountering many other troubles, of which those who use this class of rim are well aware. They may be summed up as the mechanical defects of the system. There is a popular notion that by the use of the pneumatic tire advantages are always gained. This is only true if certain conditions are observed. It is evident that unless the tire is inflated to a proper degree, which must be regulated by the load, also that it shall be of sufficient diameter that the stones most generally met with on the road will sink into the tire—the pneumatic, so to speak, must swallow all the obstructions it meets with in its path - its main virtue would be gone. Personally, I do not view with the utmost favor the pneumatic tire, on account of the mechanical disadvantages. Indeed, if the springs of a carriage are sufficiently well made and adjusted, a circumstance rarely to be found, the advantage of the pneumatic is almost absent, and I believe that for motor traffic the steel or solid rubber tire will prove the favorite in the long run, when sufficient attention is given to carriage springs. The chief function to be fulfilled by the carriage spring is to enable the load to travel on the level while the wheels of the under carriage are mounting up and down as they pass over road obstructions. The weight of the portions which rise and fall are very small, compared with the vehicle and its load. Although it has been asserted that the draft is greatly diminished by the use of pneumatic tires, my own experience does not bear this out except in given cases. On bad roads an advantage may be gained, but on good ones the steel tire carries the palm. Quite apart from experiments, it is only necessary to watch the pull exerted by a horse on various classes of roads with the same carriage tired in different manner. It is found that the rubber of the pneumatic tire will burn if the load is very heavy. Whether this is due to the successive compressions of the air when meeting the obstructions on the road, or whether it is owing to the friction of the air in the tube, due to lag in having to pass through a very restricted opening in a portion of a tube, *i. e.*, that part which is in contact with the road, and to friction generally, it is difficult to say. The fact is there. Messrs. de Dion and Bouton had the greatest trouble on this score with their tractors, and finally decided to fall back on the solid rubber. It is quite possible to make a pneumatic tire suitable for very heavy roads, but the thickness and size would be so great that the advantages to be derived would be virtually absent. In the case of cycles and motor-vehicles of that type, the pneumatic tire is an undoubted advantage, for in one case it removes much of the vibration from the feet, which would be conducted to the body, and in the other it might be found difficult to introduce suitable springs on the ground of the weight or of expense. The pneumatic axle is the true solution to the trouble, when a satisfactory one is made. The horse is able to start a carriage by exerting his maximum power He anchors his feet to the road, throwing forward and dropping the weight of his body. An engine, however, does not possess this property. An engine of any given horse-power has its capacity calculated for a given rate of speed. For instance, if a six brake horse-power motor is purchased with a normal speed of 300 revolutions per minute, it is understood that this brake horse-power will only be given off when the speed in question is reached, at a given gaseous pressure in the cylinder. Consequently, when the crank, or its equivalent, is turning more slowly, six horse-power is no longer given off. It is at the moment when the vehicle is to be started on the road that a large horse-power is required, and it is at this time that the engine is incapable of giving it, unless it is run at a considerable speed first, and then geared to the carriage. This is a quality, and indeed a defect inherent to all the known oil and gas motors, where a clutch of some kind is necessary. Great pains have been taken to achieve success in starting and stopping oil and other motors of this class placed on carriages, when passing through traffic, but even if this latter end were attained nothing would have been gained, because of the time necessary for the motor to get up its speed before the carriage could start running afresh. It may therefore be concluded that until some further, and at present unknown, improvement comes about, the oil-motor will have to be kept running at all times during temporary stoppages, which, apart from other disadvantages, is very wasteful. The electro motor offers certain advantages, inasmuch that it is easy to stop and start, for accumulators possess a reserve power similar to the steam engine, but may be at the risk of wearing the accumulator. Of course, if large electro-motors or other forms of engines were carried than are necessary, some of the difficulties pointed out would be greatly reduced; but practical considerations, such as expense, great additional weight, bad economy in working, bar such a procedure. With the steam-engine we have a great reserve power. It is merely a question of raising the steam pressure by the application of more heat to the boiler, or of using the heat already given to the boiler in a more advantageous manner, to obtain the additional power. It might be urged that a 4 hp steam engine would not be strong enough to render 10 horse-power at any time; but by putting a few pounds extra weight into the working parts there is no difficulty or danger in accomplishing this, though such an engine would not be suitable for running continuously at the higher power, on the ground of want of economy, as the boiler would be continually strained to its utmost, and this, although it might not be productive of danger, would be an unfair tax to place upon it, and would necessitate earlier renewal. This is why the steam engine, when placed upon the road carriage, can start and stop in the traffic with the same facility as the railway locomotive does with its train. It has been urged by some leading engineers that the main success of the railways has been due, not to the locomotives, but to the nature of the road, and no doubt there is much truth in this, for plate ways, granite ways, and other tracks of a similar nature suitable for highway purposes have been proposed, and may in the future find still more favor. But it is hard to bring one's self to imagine that the ingenuity of man cannot modify the locomotive to suit the road, when it has harnessed far more difficult problems. Many devices have been put forward for constructing a road engine which shall lay its own rails as it proceeds. Some of the methods are very ingenious. In some cases planks or rails are laid and raised as the wheels pass along; in others, the wheels travel in a large circular ring. Patents for similar methods have been taken out over and over again, and it appears to me a disgrace that a Government department should thus take money under false pretences. All the advantages to be gained by the use of

movable rails or other equivalents can be obtained by modifications in the wheels, without the auxiliary. At the same time, there is much to be said in favor of some of the proposed schemes. I will give one or two instances. If a combined locomotive and wagon is to be taken over a ploughed field to collect produce, the process might be impossible if the ground were soft; yet if the planks were laid along the route to be taken the difficulty would be overcome. The equivalent to this would be self-laid rails carried by the locomotive. Again, the wheels running within a large circle present the advantage to be gained by the use of very large wheels, which by any other method would be impractical, so that a locomotive could proceed over very bad roads, which might otherwise not be possible without excessive engine-power. It has become the habit to pooh-pooh these devices, but I think that there is more advantage to be gained from them than it is usual to give credit for, especially under certain given conditions.

STEAM MOTORS.

I will now turn to steam power on the highway. After a careful study of probably every self-propelled carriage which has been made from the earliest times to the present day, I have come to the conclusion that Hancock's disposition of the working parts cannot be improved upon. This was my opinion long ago, and I was pleased to find Sir Frederick Bramwell and others uphold the same view. I pointed this out to M. Serpollet, who, having examined the matter, is in full agreement, and his new carriages are being built on these lines. I regard this circumstance as a compliment to English engineering. Of all motors for carriages at the present day I hold that steam is by far the most suitable and advantageous for real work, and that when the Serpollet boiler or one of a similar type is employed, nothing more can be desired for many years to come. Of English manufacturers already busy at work on steam road vehicles, Messrs. Philipson and Thornycroft may be reckoned among the leaders. The steam carriage which has been brought nearest to perfection at the present time is that designed by M. Serpollet. I will therefore give a brief description of his vehicle with its most recent improvements. M. Serpollet has adopted the present type from the instructions I gave for the carriages constructing for me. The engine and disposition of the parts are all simple matters not subject to patents, and not capable of material improvement, as they have all been common knowledge for the past 70 or 80 years. The boiler and furnace alone have been the main difficulties in connection with the subject. Many waterless boilers appeared before M. Serpollet's time, but to him the credit is due for having devised a form of boiler, simple, cheap, and effective. The principle of the Serpollet boiler is so well known that I need not enter into it again. It will only be necessary for me to describe the boiler and furnace in their most recent form. The earlier ones were not practical from an engineer's point of view; the furnace was large, a great weight of fuel was necessary, and fumes were produced. The present boiler is made up of several tiers of crushed bent tubes, the steam space being horseshoe in section, and a petroleum furnace. The chief improvements consist in very materially strengthening the metal of the tubes, which gives the advantage of a reserve for storing heat, which is essential, as well as for durability's sake, and the method upon which the tubes are built up is far simpler and renders repairs, when found necessary, rapid and easy to carry out. Those tubes which are nearest the fire are thicker than the elements more distant. In some forms the tubes are further bent into spirals, thus giving additional strength and an increased heating surface. The fire itself being a heavy oil petroleum furnace, offers lightness and security against breakdown and accident. A large reduction in weight, due to this form of furnace, gives an all-round advantage, especially now that the engines are constructed to condense. The ton of fuel and water which at one time it was necessary to carry, is now largely dispensed with, and in consequence the carriage does not require to be so strongly built. Ten hundredweight, at least, are saved in the weight of the carriage and furnace. In consequence the older carriages, which weighed at least two tons when prepared for a long journey, could now be constructed to weigh 10 to 20 cwt. laden. But as the carriage at present being made weigh nearly double the lower weight mentioned, it may be asked why should this be so? The reply is that there is a growing tendency among French manufacturers to build on English lines of solidity rather than elegance and lightness, and a great deal more weight is being put in those portions where the strains come. Six cwt. is very soon accounted for when this is done, and in order to secure the convenience of a movable body portions of the framework are duplicated, *i. e.*, the underframe must be there as usual, and the frame for the body must be a separate one, so that additional weight is found in this direction. The modern steam carriage weighs about 18 cwt., and is far more satisfactory than the old forms, and decidedly superior to any of the oil-driven motor-carriages which have appeared before the public. There are many points of importance in the construction not new in themselves, in which strength and lightness are the main features obtained. The guiding bar does not act directly in steering operations, but by means of a multiplication wheel, for unless some method such as this is adopted there is a danger when meeting a large stone on the road of overpowering the driver and throwing the carriage to one side when traveling at a fair speed. The multiplication arrangement gives better control to the driver rendering such an accident impossible. Another way is to place the turning point of each wheel within or over the axle. The body of the carriage, so far as the eye is concerned, appears as one. In reality it consists of three divisions—the conductor's seat with a place beside him in front; a boot at the back, similar to that of the phaeton, but no seat in it; and between the boot and the box seat the space is occupied by a victoria brougham, van, or any other kind of body that may be desired, these bodies being removable without recourse to tools, and interchangeable at pleasure. The front place can be covered by a glass cab to protect the driver and his companion from the weather. At the back of the boot are two doors. On opening the right hand one the boiler is seen, and the left-hand cupboard contains a vertical engine. The engine is a double tandem expansion type and the reduction of speed as between the engine and driving wheels is not so great, this being effected by means of a specially constructed strong single chain, situated midway between the right and left driving wheels, just as Hancock placed it in his carriage. This chain is dispensed with in some cases so that the driving is direct. The engine cranks, chain and any other working parts are completely encased, so that no mud, dust or wet can reach them. The engine is capable of giving off powers varying from four horsepower normal to ten maximum. The boiler pressure can be raised to 16 or 17 atmospheres without danger. Briefly, the following is a summary of the advantages presented by the new petroleum furnace:

(1) No smoke is produced when the burner is preparing to be lit.

(2) Very little methylated spirit is required for lighting.

(3) When making a stoppage for a considerable time, such for instance, as paying a call, the petroleum is cut off from the main burner while the auxiliary burners keep the former hot for starting afresh.

(4) The burner can also be cut off when descending a hill.

(5) The expenditure of heavy petroleum, which can be obtained in this country at from 3*d.* to 4*d.* per gallon, would not, on the average, exceed in the case of a carriage, such as described, 1½ gallons per hour when carrying four people at a speed of 12 miles per hour on average roads.

(6) The weight of the carriage unladen will not be greater than one ton.

(7) Six minutes only are necessary to prepare the carriage for running, and being free from all complications any intelligent man can drive it.

The natural question suggests itself, should the boiler or burner wear out how often is renewal necessary? In the case of the boiler it is only the lowermost tube which requires occasional renewal, though, of course, in time the boiler will wear out. The present cost of this tube is about £1 10*s.*, and perhaps, once or twice a year it might be necessary to replace it if the carriage is greatly used. The whole boiler is priced at the present time at £30, but total renewal is necessary only after many years of wear. I should estimate that even with hard work, *i. e.*, working the boiler harder than is fair, the annual expense would be considerably under £5. These boilers when made in England will undoubtedly be cheaper. The expense of renewing any part of the burner is exceedingly small, a few shillings would be the outside, and it would probably not be necessary to do this every year. The repairs and expense of certain renewals in the case of petroleum-driven carriages is far greater than this, as all those know who own these vehicles, so that steam possesses the advantage over all such motors, although I am ready to admit that when a light, cheap, and lasting high-capacity accumulator makes its appearance, electricity will stand before steam for attention and comfort, if changing and charging stations exist throughout the country at easy distances. There are several points in connection with steam carriages which cannot be overrated, and greatly to be appreciated, by those who have been in the habit of using petroleum-driven motors. The chief one is that the crawling process up a hill is dispensed with, and 12 miles an hour up the steepest hill which horses and carriages at present climb, can be obtained without an effort. Secondly, when stopping and starting in the traffic, the engine is stopped and started as would be done in the case of a horse. Since the whole of the steam is condensed, none of it passes into the atmosphere. Should by chance any do so, being superheated, no vapor escaping is visible, and days may go over before it becomes necessary to take in a fresh supply of water to make up for any slight waste there may be. There are no valves to grind, no cylinders to clean, no inflammable material to store at home or carry when on a trip, no unpleasant smell is produced, there is absolute freedom from vibration, no chance of a breakdown when least expected, no accumulator to charge, or platinum points to be renewed, no ignition lamps and tubes requiring attention and occasional renewal, all repairs that may become necessary at any time, the carriage builder, or even the village smith, can carry out. Quite apart from the advantages mentioned there is another which is of great practical importance; and is, that any moderately intelligent man, with a few hours' instruction, becomes master of the engine and carriage. It is possible to find men who have been accustomed to steam engines in large numbers. There ought, therefore, to be no difficulty in finding a supply of drivers in proportion to the demand. This is not the case with oil-driven vehicles, on account of the complexity of the working parts, combined with a quality unknown to the steam engine—that of developing some new defect when least expected.

OIL AND GAS MOTORS.

All motors may be divided into balanced and unbalanced sections. By "balanced" I do not refer to the parts of the machine being duly poised, such for instance as additional weight placed on some part of the fly-wheel to balance the weight of the crank and any rods on the opposite side. I use the expression in regard to the primary force. For instance, we all know that in the gas engine the running is spasmodic, and can only be overcome by the use of enormously heavy fly-wheels, so great indeed that in practice a certain amount of jerkiness is preferred. All oil motors are gas-engines, and nothing more and nothing less. They may, therefore, all be classed under the one head. Steam and compressed air motors come under another category. It is well to point out the difference between the two classes of engines. With the gas engine, the pressure starts at a maximum and falls. With steam and compressed air, the pressure may rise gradually to a maximum, and then fall. This is why steam and compressed air motors run so smoothly. It may be contended that the same result could be obtained in the case of the gas-engine, by using a separate vessel to explode the gas in, and then admit such gases into the cylinder, under steam engine conditions.

Many years ago I made a large number of experiments in the hope of obtaining success in this direction, and many others have done the same. Although the results are successful in one sense, it is at the expense of efficiency and extra weight There is a method of obtaining smooth motion from gas and oil motors by counterbalancing the explosion. Many such engines have been constructed, and consist as a rule of two cylinders in each of which there are two pistons moving away and toward each other. Complete success can be obtained by this means, but only by the introduction of great complication in valves and gear so that in practice it is probably more convenient to be subject to vibration in an oil or gas motor carriage when running at low speeds than to incur the risk of difficulties which must arise with still more complex machinery. When oil motor carriages are running at a moderate speed the vehicle becomes the fly-wheel, and the greater part of the vibration disappears, but there is no means of obtaining regular and steady motion at slow speeds, however good the governor may be. There will always be a tendency for the engine, when the full power is not necessary, to run faster than the governor allows, and the speed is arrested. This action keeps on repeating itself, consequently the carriage advances by fits and starts. The oil motor carriage is only comparable with the horse-drawn vehicle for comfort when running at high speeds. With steam, compressed air, and electricity, these disadvantages are completely absent, likewise the necessity of a clutch or its equivalent. I have made some experiments with my oil motor carriage on roads covered with snow and ice It is known that many possessed of such carriages have traversed portions of Switzerland and elsewhere covered with snow. I am ready to admit that such carriages, lightly laden, travel well over snow, but after a thaw, succeeded by a frost, hill climbing becomes a dangerous proceed-

ing. I have found on several occasions, although the motrice wheels were revolving, the carriage body slipped backward, and naturally no brakes are of any avail under such conditions. I took the safest course at such times, and turned the carriage gently into the hedge, and waited for help, or procured sand to get a grip on the road. It is evident also, under such conditions, the power of the engine is not a factor in the case. I would strongly recommend possessors of these carriages to supply themselves with an ice brake similar to that which I have put on my own carriage. It consists of two rods of iron with prongs at the free ends, the other ends of the rods being hinged to the carriage. When mounting a hill covered with ice, the rods are lowered to the ground, and if by chance the carriage cannot advance, the spikes at the free ends of the rods stick into the ground and prevent an accident. This brake is inclined at an angle of 45° to the road when resting on the ground. Ice wheels may also be required in some climates.

ELECTRIC MOTORS.

A few words may now be said in regard to carriages driven by electric energy. It may be desirable to point out why electricity is not in the competition at the present time, except to a very limited degree, so far as independent traction is concerned. The only known practical method now for storing electricity is by means of batteries either primary or secondary. The primary batteries are too troublesome and expensive in the present state of knowledge to call for any remarks. The secondary battery is either too heavy, and if light, too costly for repair to be regarded otherwise than as a luxury. It is claimed by some makers that the vibration to which they would be subjected, both in the case of the heavy and the light type, does no harm and the maintenance is greatly reduced. I have no desire to let it be thought that all these statements are false, but I would point out that there is absolutely no evidence to bear out such assertions. All the evidence of the past is against the probability of such statements being fulfilled, and no new discovery has come to light to reverse past experience. Moreover, the only proof which can be brought forward contains the factor of time, and this has been so far impossible on account of the supposed improvements being very recent. It is only fair to state that some of the accumulators which have appeared of late, are more suitable for traction than the earlier ones. The modications consist in using celluloid pots, which are lighter than glass, transparent, and not brittle. These pots can be closed effectually. The plates in the section are made thinner, and in some cases wrapped round with perforated celluloid, the intention being to prevent possible contact between plate and plate. The most promising separator is the material devised by Mr. Joseph Swan. It is like cotton wool in appearance, though in reality celluloid. This "wool" is packed between the plates and around the section, converting the cell into a practically a dry one. Notwithstanding these improvements, there is yet an element of possibility that the maintenance will work out higher than is anticipated, but at any rate, the mechanical advances referred to have greatly improved matters, although the electrical properties and efficiency remains much the same. But to leave the subject of maintenance out of the question, the light accumulator is very heavy, and the losses for any type cannot be estimated at less than 20 per cent., and in practice 30 per cent. is much nearer the truth. Hence it would be unfair, from a commercial point of view, to regard the cost of the energy otherwise than one-third more than that at which it can be produced. There would be few who will disgrace with me when I state that a very fair price for the electric energy per unit is 3*d*. Although I do not contend that under exceptional conditions it cannot be produced for less, yet the figure given is by no means an unreasonable one, from the extensive knowledge we have of the cost of the production of electric energy at lighting-power stations throughout the kingdom. Consequently, if the electric energy is to be carried, about 4*d* per unit is a fair estimate of the cost when used on a moving vehicle. Roughly speaking, three-fourths of a unit is a theoretical horse power. In practice, unless the motor is very large, say, exceeding six horse-power one unit per horse-power is the approximate expenditure of energy per hour. No doubt many will say this is excessive for a carriage carrying a six-hp motor, capable at times of giving off a large power, but I would point out that when the roughness of the roads comes to be considered, and the stops and starts necessary when approaching and running through towns my estimate is an exceedingly fair one. To sum this up, I contend that, as matters stand to-day, it is impossible to reckon the power delivered in an electric carriage at less than 4*d*. per horse power per hour, which, of course, is enormous when it is further considered that maintenance has not been taken into consideration at all, and that only a short distance can be run before the accumulators must be recharged, and that unless charging stations are to be found throughout the locality where such carriages run, a useless mileage must be added for getting the vehicles to the charging station and back to the points where they have to be used.

BENZINE AND STEAM CARRIAGES.

Now compare these conditions with those of benzine and steam carriages. The cost of benzine gas may be roughly taken as equal to coal gas at 3*s*. 6*d*. per 1,000 cubic feet. Hence a gas-motor using benzine works out nearly one fourth of electric energy. In the case of steam, using petroleum for the furnace at, say, 6*d* per gallon (in large quantities, however, it can be purchased at about half this price), the cost per horse-power per hour would not differ materially from the cost of the benzine-motor, and consequently far cheaper than electric energy. In steam engines using coal or coke, taking the price of fuel at £1 per ton and the consumption at 12 pounds of fuel per horse-power per hour, the cost is about the same as crude petroleum.

It has, however, been found in the case of locomotive engines that the petroleum fire is nearly double the price of a coal one. In this case it must be remembered that coal was costing about half the figure I have just given, so that if coal, say, at 12*s* per ton, can be obtained for road traction, the working cost is still further diminished. Practically benzine and steam came out four times cheaper than electric energy. All these facts should be borne in mind by those who think of embarking money in electrically propelled vehicles. In round figures the efficiency of a good steam engine may be taken at 10 per cent., but for a road carriage this would probably not be better than from 5 to 7 per cent. A gas engine, whether using coal benzine or other gas, has an efficiency of about 25 per cent. Electro-motors have a commercial efficiency of from 80 to 85 per cent., but in this latter case so many conversions of energy are made between the coal and the electro-motor that the actual efficiency is very low indeed.

ELECTRIC MOTORS.

I have always held the view that a perfect accumulator will

not appear until the discovery of some new and cheap metal, not that the ideal accumulator cannot be produced to-day, but only at forbidden expense. At the same time discovery may lead to the production of a battery of some type, quite different to that which we are at present accustomed, depending possibly on some new principle. It must not be thought from the various remarks I have made on the value of electrically driven vehicles, that necessarily they have no future as matters stand. My remarks apply to those instances where the carriages are to be used commercially to obtain a good money return. Omnibus horses have to earn a certain amount per day. But this is not the case with a pleasure horse, or with an animal kept by a professional man. In such instances the maximum commercial output of the horse is not sought for, and under these conditions electric energy may do very well, provided that the following conditions can be obtained :

(1) A guarantee from a company to keep the accumulator in order.

(2) That conveniences for recharging the accumulator exist.

(3) That the distance to be traveled in one day shall not utilize more than the electric energy stored at one charging.

M. Jeantaut was one of the first in France to make an electric carriage, though many had been constructed in England previously. M. Duracq's carriage, which was shown at the Salon de Cycle in December, 1896, is undoubtedly the best carriage of the kind which has yet appeared. I have had the opportunity of examining the vehicle closely, as well as riding in it, and it is admirably adapted for town use. M. Duracq, in a pamphlet, gives calculations to show that the electric energy is cheaper than living horse-power. The whole of his estimates and allowances are faultless, but an error creeps in, according to my mind, at the start, where he assumes too small a power to pull one ton at eight miles per hour along a road. The figure he gives may be true on a leval asphalt road, but my experience, which is verified by that of others, would go to show that at least three times the power allowed is required in practice, taking roads as we find them. Neither is any allowance made for restarting after stoppages, when considerably more current is necessary ; and since an electric carriage is more likely to be used in towns than elsewhere, such stoppages in the traffic will be frequent. If these various points are taken into consideration, instead of electric traction coming out as M. Duracq makes it, 40 per cent. less than horse traction, it will be found to be very much greater. In order that there shall be no misunderstanding I will quote the figures upon which the calculations are based. M. Duracq takes a well suspended carriage, and estimates 35 kilogrammetres per ton, for speeds varying from 12 to 15 kilometres the hour. In English this means less than one half horse-power to do the work named, and all those who have experimented with self-propelled vehicles know that this is much too small an allowance, except under the most favorable conditions.

(To be Continued.)

THE HORSELESS AGE is doing good work for motor interests.
Syracuse Herald

I read your magazine with great interest and the only trouble I find is that it is not published oftener.
WHITMAN, MASS. F. P. WILLIAMS.

I think THE HORSELESS AGE is a most reliable journal, and an invaluable one to all interested in motor carriages.
PITTSBURG, PA. E. P. HODGES.

ENGLISH PATENTS.

12,439. *D. Clerk, Sutton Coldfield, Warwick. Oil Engines.*—[3 *Figs.*] June 6, 1896.—The engine has a single cylinder, A, and piston, B. The back portion C of the cylinder acts as a motor end, while the front portion opens out into an inclosed crank chamber, D. The motor impulses takes place every revolution behind the piston B, while the air in front is compressed into the crank chamber D to a few pounds above atmosphere. The piston B overruns an exhaust port, E, at or about the end of its stroke, when the pressure at the motor end falls to atmosphere, and at this time the compressed air in the crank chamber blows open a non-return lift valve, F (preferably placed in the piston, as shown), so that the air from the crank chamber D flows into the motor end C of the cylinder, and scavenges out the burnt gases through tha exhaust port E. An air suction valve, G, is arranged in the crank chamber D, so that on every back stroke of the piston air is drawn in. The oil vapor is produced as required for supplying the engine from a small reservoir of oil having its surface kept under a constant air pressure of from 10 to 30 pounds, by means of an ordinary air pump. The vapor lamp J consists of a metal coil, K, having the end L communicating with the oil reservoir, while the other end M leads to the nozzle burner N, fixed centrally underneath the coil. In the lamp the coil K, for convenience of

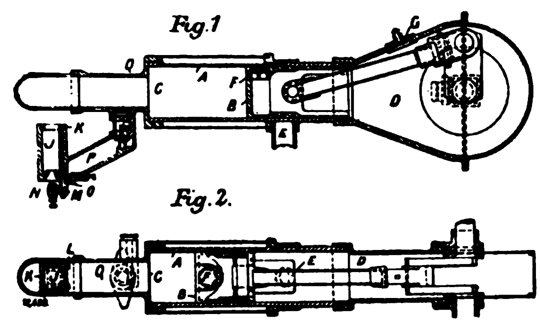


Fig. 1
Fig. 2.

making and cleaning, is formed by drilling straight holes leading one into the other. Any number of these coils may be used. The lamp J is put into action by a preliminary heating before oil is admitted from the reservoir. When the oil is admitted up past L the hot coil at once vaporizes it, and a jet of vapor at high velocity issues from the burner N. This jet is lit, and passing through the coil K, keeps up the production of vapor as long as the lamp is kept burning. The nozzle burner K has a conical sleeve round it that a current of air is induced by the high velocity of the vapor jet to mix with it, and thus produce a Bunsen or reducing flame instead of a luminous one. On the end of the motor cylinder A is arranged an extension, O (preferably tubular) or the combustion or compression space, and the Bunsen lamp flame is caused to impinge on this tube, so that it forms a combined combustion chamber and ignition tube. The oil vapor from the chamber P is admitted at the termination of exhaust and scavenging into this tube, Q, but as sufficient air is not present, no ignition takes place; however, on the back stroke of the piston air is forced into the tube Q, and mixing with the vapor at the hot end explosion takes place, and thus a motor impulse is provided. By so arranging the length of the tube and the extent and position of heating, the explosions may be accurately timed. (*Accepted April* 14, 1897.)

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

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Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE, which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection with a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

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R. M. DALE, 861 Eighth St. San Diego, Cal.

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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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Prejudice at Washington.

The Federal Commissioners of Washington, D.C., recently refused the application of a local firm who wished to run a motor delivery wagon in the streets of the capital, on the ground that it would frighten horses and thus endanger life and property.

Such official fossilism at the very center of American legislation, in a city of wealth and culture whose pavements are peculiarly adapted to the new locomotion, will excite amazement among Europeans who have been told of the progressiveness and alertness of the American people. The proposition which the Washington Commissioners grappled with as a new issue has already been thoroughly canvassed and settled in the capitals of the Old World. It was settled there in favor of the motor vehicle as virtually the same question had been decided in favor of the bicycle and the railroad locomotive, when these two modern inventions applied for recognition from the public authorities. Prejudice and opposition were encountered in those cases as in this, but the final verdict here must be the same as the final verdict there. Locomotives and bicycles often frighten horses and so destroy life and property, but no law makers would undertake to sweep them from the face of the earth on that account. They are too useful. It is also generally admitted by intelligent persons that the motor vehicle has a very important work to do in our civilization, and if the Commissioners are not aware of this fact, they should take the pains to inform themselves before passing judgment upon so momentous a question.

The march of events will soon compel them to reconsider their action, but the earlier they do this the more graceful will the recantation be.

Motors Free in France.

Paradoxical as it may seem, so great is the demand for motor carriages in France, some people are getting them for nothing. The paradox is explained in this way. Orders are booked by manufacturers chronologically for future delivery. It frequently happens that those who are fortunate enough to have early dates of delivery are offered liberal bonuses by enthusiasts whose dates are much later or whose orders are not yet booked. Hence by placing a number of orders and selling his chances successively a buyer may finally obtain a carriage free of cost. And yet no microscope is needed on this side of the Atlantic to find people who say there is no demand for motor carriages and that they are not a success.

A Lesson from France.

The motor vehicle industry is pushing ahead in France. New and powerful companies are entering the business, old concerns are increasing capital, shops are busy, orders are booked far ahead, races and competitions fall thick and fast, and the whole nation is full of faith and enthusiasm. In view of the splendid progress there, Americans are decidedly slow to grasp the possibilities of the motor industry. On the eve of returning prosperity American capital can find no more promising field for employment than the development of the motor vehicle in our own country.

The Steel Highway.

The Agricultural Department at Washington is doing commendable work through its Bureau of Road Inquiry for the cause of good roads. The experiments which it has been conducting with the new steel highway, destined to be the ideal roadway of the future, have brought forth interesting and conclusive data as to the comparative economy of steel, macadam, asphalt, and other roads, and establish beyond question the superiority of the first named. Now that a number of experimental sections of steel roads are in successful operation in different parts of the country and arrangements have been made with manufacturers for the supply of the steel rails, the mileage of the new roadway should be rapidly extended. In this extension the promoters of the motor vehicle are deeply interested.

The Horse an Unruly Motor.

The position of the average horse driver was aptly set forth by J. Frank Duryea a few days ago when he remarked: "The average driver prides himself on his horsemanship and praises the intelligence and obedience of his horse, but as a matter of fact he begs his way through the world. He is constantly lifting his hand and signaling the motor vehicle to stop until he can get his horse under control; which in reality means until the horse himself decides to go ahead." This is too true. The horse is a willful, unreliable brute. The ever-recurring accidents due to horses which are daily set forth in the papers prove that the horse is a dangerous motor and not the docile pet of the poet. The mechanical motor is his superior in many respects, and when its superiority has become better known his inferiority will be more apparent.

The Radius of Action of Electric Motor Carriages.

By Hiram Percy Maxim.

The objection that is most frequently raised against the electric motor carriage is "the difficulty of getting it charged." It has come to be the general conclusion among people even well versed in motor vehicle matters that a carriage propelled by electric storage batteries is unable to run beyond a very limited distance from an electirc light station. In numerous instances even some of the technical journals devoted to the motor vehicle industry have caretully excluded the electric storage battery from the list of possibly successful motive systems.

So persistent have been these contentions that even in the minds of those who have had actual experience with well-equipped electric motor carriages this question became one of doubt. In no recorded case had any one made an actual trial in a properly constructed electric carriage with a view to definitely ascertaining just where the touring limits of the electric carriage actually lay. It has been the good fortune of the writer, recently, to make an actual test of this question in one of the Pope Manufacturing Co.'s Columbia carriages. Although the makers expressly declare the vehicles to be designed for city and suburban service and do not regard it as adapted to touring purposes, these carriages are fitted with the latest achievements in electrical traction apparatus, and the opportunity for the procuring of valuable information was an exceptional one. The experience, according to the best knowledge of the writer, is the first that has been recorded in which a carriage propelled by an electric storage battery was used for the purpose described.

The start was made from Hartford, Conn., one evening with the intention of running through to Springfield. Mass., returning the next morning. Stops were to be made at as many towns along the route as was possible in order to ascertain by experience what might be the actual difficulties, if any, of getting current for charging the storage batteries.

As the Columbia carriages are geared to a fixed speed of twelve miles per hour on a level, no consideration could, of course, be given to the question of speed, although the times of running were noted.

The first town out of Hartford was Windsor. The distance from the starting point was eight miles and the time occupied in making the distance was thirty-five minutes. The roads were in good condition, but quite hilly. The battery indicating metei indicated that 1¼ kilowatt hours of the total of 5 in the batteries had been used.

Upon arriving at Windsor information was asked as to the possibilities of getting electric current for charging the storage batteries. The information received was that the only place available was the works of the Eddy Electric Co., which were closed during the night. We were informed, however, that during the day time current was available at this place.

The journey northward was then continued, the next town being Windsor Locks. The distance from the starting point in Hartford to this place was thirteen miles, and the time occupied in getting there was one hour and fifteen minutes. Part of the road was through very deep and soft sand and numerous bad hills had to be ascended. Upon arriving in Windsor Locks inquiry was again quietly made as to the possibility of obtaining current for charging the stoiage batteries. We were promptly referred to the Windsor Locks electric

light station. This place was found located at the foot of a short hill, the grade of which must have been 15 per cent.

Upon application at the station it was found that the apparatus used for furnishing the town light was alternating, but that direct current was available from the exciting machines used in exciting the fields of the alternating current generators. The officials in charge of the station were most cordial, and in a very short time the necessary connections were made and the charging of the batteries in progress.

After permitting the charging to go on for about one-half hour, we considered the availability of current at this point adequately demonstrated. The wires were disconnected and we resumed the road northward after successfully negotiating the 15 per cent. rise.

It had now become thoroughly dark and the running through the quiet country in the cool, sweet scented air with the electric headlights of the carriage literally blazing was an experience inspiring to say the least. The almost noiseless action of the electric carriage and the perfection and simplicity of its control made the running seem ideal. Although the road throughout was entirely strange it was found that the brilliancy of the electric headlights made traveling at night as safe as in the daylight. The road could be seen for at least 100 feet ahead, and the tinge of excitement when running into the dark, wooded districts added materially to the pleasure.

Thompsonville, on the east bank of the Connecticut River, which was crossed on the Enfield Bridge, was the next town reached. It is eight miles from Windsor Locks and the time taken to make it was forty-two minutes. The roads were in very good condition and only one hill of any magnitude had to be ascended. Upon arriving information was again asked as to the possibilities of obtaining electricity for charging the storage batteries and we were at once directed to the Enfield Electric Light & Power Co. The carriage was run to this place where it was found that Edison direct current apparatus was in use, which could be connected directly to the carriage terminals without any change whatsoever.

Although the people at this station had never before seen a motor carriage, the necessary connections were quickly made and in fifteen minutes the charging was in progress.

After remaining a short time the terminals were again disconnected and, after giving the officials at this station a sample ride about the town, the road for Springfield was again resumed. This road was found to be in excellent condition, but to have very many severe hills. All of the ascents of these hills, however, were made at a smart pace, thanks to the continued freshening the batteries had received, and it is needless to say that owing to the now late hour the descents were made at something more than a smart pace. In some places there is no doubt that the speed was fully 35 miles per hour. The road from Thompsonville to Springfield is through a fairly well settled country and is extremely pleasant riding. Springfield is about eight miles distant and the time occupied in making it was forty-seven minutes. Arriving at Springfield, which has a large and unusually well equipped and regulated electric light station we proceeded at once to the latter place. It was found here that alternating apparatus was the principal one used and that, as at Windsor Locks, it was necessary to get the current from the exciting machines. Through the courtesy of the management, this was soon arranged, however, and the carriage was shortly being charged. At this place the battery indicator indicated three spaces of the five on the battery indicator as used. As it was desired to run about the city of Springfield in the morning before returning to Hartford, the batteries were charged until the indicating finger had returned completely to the "full" position. Having returned to this point, we departed for the Massasoit Hotel. Arriving here we went through the ordinary procedure at the stable precisely as though we had an ordinary horse and carriage. Instructions were left with the stable keeper to wash the carriage in the morning precisely as he would any other carriage.

In the morning, after breakfasting and listening to the interested talk of numerous people who had seen the carriage on the previous evening, we repaired to the stable and found everything in perfect condition. We then visited numerous places in the city, giving different people short rides, and at 9.30 we started on the return to Thompsonville.

Thanks to our generous dispensation of rides in Springfield, when about two miles out of Thompsonville the battery indicator showed that almost the entire contents of the battery had been consumed. At the arrival of the carriage at the electric light station in Thompsonville it was noted that the carriage was rapidly slowing down, although it was very plain that the batteries were still "willing." This characteristic of the electric storage battery to respond even to the most abusive loads is one of its most useful peculiarities, which, when understood, gives it a warm place in the heart of the motor carriage driver, and insures the electric carriage a permanent place in those fields where its limited radius of action is of small importance. Not until the last bit of current has been removed will it yield and even then, after a short rest, it makes an effort to do one's bidding. A good storage battery is like a good dog.

The batteries were completely filled at Thompsonville. The return trip over the road to Windsor Locks was a very rapid and most enjoyable one, and owing to the daylight and the publicity of the occasion, considerable excitement was caused along the road. Although carriages equipped with other kinds of power have passed along this road in the past, the fact that this was the first "motor voiture de luxe" prevented any diminution in the interest shown. Windsor Locks was passed at a good twelve-mile gait and Windsor reached without a stop from the time we left the electric light station at Thompsonville. The distance between the two places is between twelve and fourteen miles and the time occupied in making it was one hour and five minutes.

A short stop was made at the Eddy Electric Co., through the courtesy of whom we were able to carry out our intention to ascertain officially the availability of current on subsequent trips through Windsor and to make a specimen charge, after which the return trip was resumed. The works of the Eddy company are eight miles from the place where the carriage is kept at Hartford, and the time occupied in making the run was forty minutes. The arrival home completed what is probably the first country trip of any electric carriage, the use of which, it is now apparent, is in some localities, in fields beyond those to which its essential peculiarities ordinarily confine it. The makers of the Columbia carriages issue with their vehicles an interesting little pamphlet giving such information as is necessary to extend this field to the utmost, including a list of the principal charging stations in some of the Middle and Eastern States.

It was found on the trip that the cost of electric current at the different electric light stations was such as to make the cost of running between 1½ and 2 cents per mile. In the

smaller country stations the charges are high, but in the large cities the charges are such as to make the cost of running comparable with those of gasolene carriages. Six cents per kilowatt hour is the average price charged at large stations, resulting in a cost per mile of 1¼ cents.

To ascertain the ability to make an extended tour in the Eastern States, an examination into the location of the different electric light stations was made by the writer. The results of this investigation indicated that starting from, for instance, Hartford, current could be obtained at intervals which would enable an electric carriage to easily run to Boston. Current is obtainable at Thompsonville, Conn., Springfield, Mass., which is twenty-nine miles from Hartford; Palmer, which is sixteen miles from Springfield; Warren, which is eleven miles from Palmer; South Spencer, which is eleven miles from Warren; Worcester, which is seventeen miles from South Spencer; Westboro, which is thirteen miles from Worcester; South Framingham which is ten miles from Westboro; Wellesley, which is seven miles from South Framingham; Newton, which is eight miles from Wellesley, and Boston, which is seven miles from Newton. Of course, there would be no need of stopping at all these stations, as the batteries in the Columbia carriage are good for twenty-five miles on ordinary country roads.

In the first part of the eastward trip from Springfield the roads are very hilly and sandy and it is probable that the mileage of the batteries here would not be greater than twenty; but even so, it is seen that electric light facilities are ample.

Going westward from Hartford, it was found that electric light stations where current is available are located at New Britain, ten miles from Hartford; Meriden, ten miles from New Britain; New Haven, nineteen miles from Meriden, but between which there are large mills using electric lights and willing to sell it to carriage users; Naugatuck, which is thirteen miles from New Haven; Bridgeport, which is five miles from Naugatuck; South Norwalk, which is fourteen miles from Bridgeport; Stamford, which is eight miles from South Norwalk; Port Chester, which is eight miles from Stamford; Mamaroneck, which is five miles from Port Chester; Mt. Vernon, which is seven miles from Mamaroneck, and Forty-second Street, New York City, which is fourteen miles from Mt. Vernon. In New York current is available in almost any locality, even at many private residences.

In running out of New York it is found that the electric light stations up the Hudson river toward Albany are at near enough intervals to make touring also possible, and the same is the case between New York and Philadelphia. In the vicinity of Philadelphia the facilities are not quite so good in all directions, although the most enjoyable trips are in the direction in which electric current is available.

The only disadvantage that can be connected with the charging of storage batteries is the time required. In recharging mechanical carriages it is, of course, merely necessary to obtain the fuel. In the case of an electric carriage, however, a certain amount of time is necessary. In no case, however, unless the batteries are completely discharged or empty, is it necessary to take more than one and one-half hours. In many instances, in the experience of the writer, the current consumed in a run of twenty miles has been returned in one and one-half hours.

Of course, at the present time the best recharging facilities exist in the Eastern States. It is probable, however, that even in the Middle-Western States the distances between stations where current can be purchased is so small that touring is possible whenever the condition of the roads would permit.

In this connection, and in conclusion, it may be interesting to state the number of towns and cities in the different Eastern and Middle States that have regularly equipped electric light sections. The following is a list:

Maine	39	New Hampshire	35
Vermont	23	Massachusetts	99
Rhode Island	12	Connecticut	34
New York	183	New Jersey	61
Pennsylvania	199	Delaware	5
Maryland	21	District of Columbia	2
Virginia	37	West Virginia	21
Ohio	133	Michigan	117
Indiana	96	Illinois	197
Kentucky	37	Iowa	106

Electric Cabs in London.

We had an opportunity this week of inspecting some of the London Electrical Cab Company's vehicles, says the London *Electrician*, and we were agreeably surprised with the care and thought which have been expended in their design. If the new company is not too much hampered financially by the agreements made with other concerns at the time of its formation it would be fairly safe to predict for it a success, as, if electrically-driven auto-cars are to prosper, the lines followed by Mr. Walter Bersey in the design of these electric cabs would seem to be the right ones.

Mr. Bersey points out that it is not quite fair to compare accumulator-driven tramcars with accumulator-driven cabs, as the proportion of the weights of the cells and vehicles are very different in the two cases. For example, in the case of the accumulator cars run by the Birmingham Central Tramway Company the weight of the accumulators is 2½ tons out of a total weight of about 13 tons, including passengers, while the accumulators on electrical cabs, such as those now put into service by the London Electrical Cab Company, weigh upward of 14 cwt. out of a total weight, including passengers, of, say, 30 cwt. The beneficial effect of this difference is of the utmost importance, for while the cells on an electrical tramcar running under the above conditions are being almost continuously discharged at a very high rate, with a consequent rapid deterioration, the cells on the electrical cabs are being usually discharged under the normal rate of discharge. With the arrangements adopted, even in ascending moderate inclines, the cells still discharge below their normal rate; it is only when ascending severe gradients such as those leading into Waterloo Station that this rate is exceeded, and then only by a comparatively small amount.

The battery used on each of the vehicles consists of a set of 40 E. P. S. traction type cells having a capacity of 170 ampere-hours when discharged at a rate of 30 amperes. It is estimated that on the level the current required, when the controller is placed at "full speed," is 24 amperes, and that on a fair incline, at about one-third that speed, this current is not exceeded. Steeper gradients require up to 30 or 35 amperes. The cut-out acts at about 100 amperes, and the driver is provided with a spare one in case of accident. The "afluidic" electrolyte which was to be used is still in its experimental stage. It is intended later to use this, instead of the usual dilute sulphuric acid, in the same type of cells. The E. P. S. Company guarantee the cells for a sum of 10 per cent. per annum of their first prices.

The battery is carried in a tray, which is slung under the bottom of the cab by four suspension links supported by springs under compression, and the ordinary carriage springs again separate the cells from the vibration to which the carriage wheels are exposed. It being considered that one of the sources of expenditure in the maintenance of traction cells is the amount of pulling about they are usually subjected to in taking them in and out of the vehicles, the cabs have been designed so as to entirely prevent any such damage occurring in their case. The cabs are placed over a hydraulic table, on to which the tray of cells is wheeled on a light skeleton iron trolley. The table is then raised until the tray comes into the position in which it can be attached to the suspending links. The hydraulic table with the trolley is then lowered, and the cab left free to propel itself away. When the cells are to be

expected. The company recognized that when its service becomes considerable it will require charging stations in several parts of London, and they therefore determined not to generate their own current for charging, but to purchase it as a day load from supply companies. In their first charging station at Juxon Street, Lambeth, the current is received from the London Electric Supply Corporation at 2,400 volts alternating with a periodicity of 83 per second. To convert this into a continuous current two alternating motor generators have been provided, each one with an output of 75 kilowatts on the secondary side. These machines consist of a British Thomson-Houston alternator coupled on the same bed-plate to a continuous-current generator of the same make. The transformation from high-pressure alternating to low-pressure continuous current is effected with an efficiency of about 86 per cent. The Shoreditch Vestry have also entered into a contract with the company for the supply of current at its second charging station, at the price of 1½d. per unit.

The charging arrangements for the cells are very complete The battery, having been detached from the cab in the manner previously described, is run on rails over the hydraulic lift, by which it is elevated into the charging gallery above. The battery with its trolley is taken on a second trolley along the gallery into its proper charging position, where it is connected up to the two conductors of the low-pressure supply. Each battery is separately connected to the charging switchboard and the charging current regulated by its own regulating resistance switch and ammeter.

The cabs are to be fitted with nitegrating ammeters, arranged so that the driver can see by a glance at the dial what proportion of the charge of the cells he has already used.

The daily receipts of the cabs are said by Mr. W. C. Bersey the manager, to average 150 per cent. more than the receipt of the ordinary hansom.

The London Cab Trade Council, an organization number ing about 60 and composed of cab owners, has declared itself in opposition to the new vehicles, while the Cab Drivers Union, numbering 10,000, is in favor of the change, and many of its members have applied for positions with the company

The police authorities of Scotland Yard subject every new motorman to a rigid test, and if he shows himself capable of managing the vehicle he is immediately granted a license At present about 15 cabs are in service.

In the office of the company may be read these pregnant words:

"I see the harness flung away,
I hear the motor's roll,
Another age dawns clear as day
On my prophetic soul."

Harry Payne Whitney, son of ex-Secretary of the Navy William C. Whitney, and Richard Peters, a well-known society man, have been regaling the Four Hundred at Newport, R. I., with horseless carriage races, both gentlemen having recently bought Pope electric carriages. Mr. Peters has taken the Newport agency for this manufacture of motor carriages.

The Erie and Sturgis Gasolene Carriage

One of our subscribers at Los Angeles, Cal., J. Philip Erie, a mechanical engineer, sends a photograph and description of a gasolene carriage, the second which he has built. The first, which was built over a year ago, is shown in the accompanying drawing. In appearance the vehicle is not unlike a massive tally-ho. The body of the carriage is high above all the machinery, which is enclosed below in a black box. This box is lined with asbestos, giving perfect ventilation to the motors and preventing any heat from reaching the body of the carriage. The fumes of the gasolene are barely noticeable, being all below and behind the carriage, and nearly all noise is prevented by making all gears alternately of wood fiber and steel. The wheels are of steel, with pneumatic tires, in which the rubber, being an inch thick, is practically proof against punctures. The only part of the machinery that is visible is a polished copper cylinder underneath the front of the carriage, and the nickel-plated levers.

In this trial carriage the space allowed for the machinery is much larger than is really required. The extra room was given to facilitate improvements and developments as the work progressed. In the carriages which will be built upon this model the motor case will be reduced in size by nearly one-third, thus removing all appearance of clumsiness.

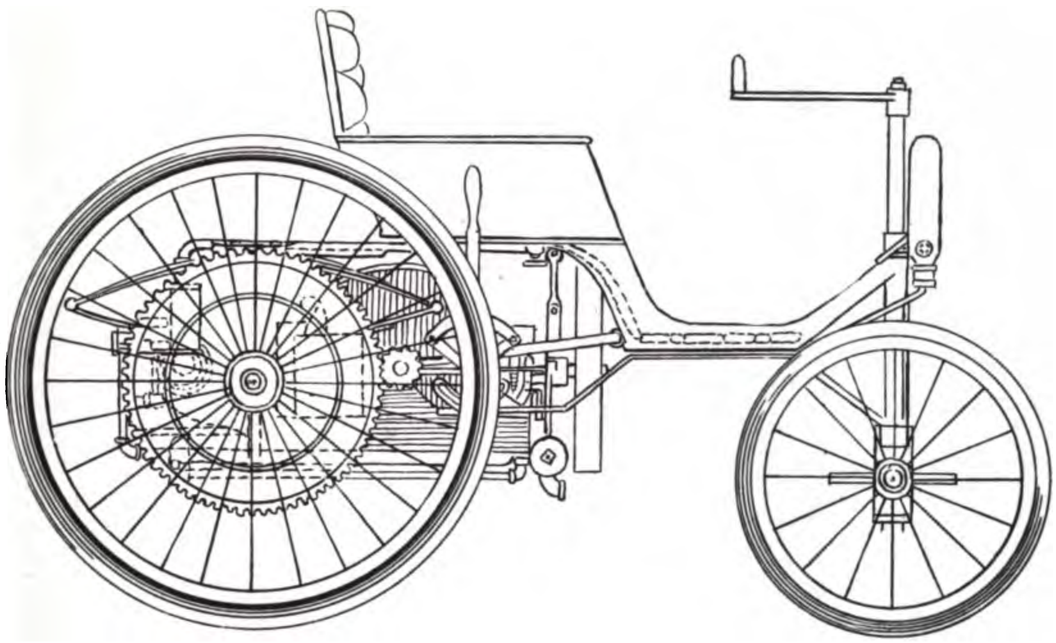
The motor has four cylinders, arranged in pairs. Universal joints form the connections of piston-heads and rods. For starting, a small crank wheel is arranged in the rear of the carriage. In front of the vehicle and under the body is located the supply tank. The hot tube ignition is employed.

By the arrangement of the motors in line it is claimed that a direct action of one upon the other is secured, with less loss from friction, than when one operates upon the other through the intervention of double cranks or other connections, and the strain upon one is taken up by the other, while the whole structure is made more compact and better balanced.

The motors are mounted on a steel frame, one pair with the fly-wheel located behind the rear axle; the other pair at the forward end of the steel frame. The disks and driving gears are located between the motors and in the center of the vehicle below the seats, thus securing a perfect balance. The steel frame and all machinery is supported by the axles, thus relieving the body of the vehicle from all strain. Motion is transmitted from the main driving shaft to the counter-shafts parallel thereto by direct gears. Upon these counter-shafts move the friction rollers, engaging the main driving discs. These disks are fastened to shafts which engage the compensating gears. The friction rollers are so arranged that they will operate the discs in either direction. If the friction rollers occupy a position at the periphery of the disks it will move at a slow rate of speed, and in proportion as the friction rollers are carried toward the center of the disk, the speed of the latter is increased.

To secure the desired frictional effect a frame is operated directly upon the friction rollers. The friction rollers are moved by vibrating arms fastened to rock-shafts. The rock-shafts in turn are operated by one lever, placed convenient to the operator in front seat, which, with the operating handle absolutely controls the vehicle.

Compensating gears are used on the rear axle, and pivotal steering in front. Ball or roller bearings are employed wherever possible. At a recent test made in the early morning hours, the vehicle is said to have proved its practicability



FIRST CARRIAGE OF ERIE AND STURGIS.

SECOND CARRIAGE OF ERIE AND STURGIS.

over two months, making good headway on all kinds of roads and grades and developing a speed of 20 to 25 miles an hour on a level.

Associated with Mr. Erie in the development of his invention are S. D. Sturgis, a mechanic of Los Angeles, and C. H. Albers, Ex-President of the Merchants' Exchange, of St. Louis, Mo.

A third carriage is now being built which will constitute a finished model from which to manufacture.

The Lacoste Qaudricycle.

One of the latest inventions to make its appearance in Paris is the "Lacoste" quadricycle. The special features of this machine are in the design and the motor. The quadricycle, or "voiturette," is intended to carry three or four persons, according to requirements, and the driver is seated behind so as to be in a position to see over the heads of those seated in front of him. This design could be splendidly adapted for a four-wheeled hansom cab, and it is the intention of the inventor to eventually give his special attention to the construction of an English hansom cab with the front wheels driving and steering at the same time (a patent the inventor holds), and the design will be placed with the manufacturers in England as soon as negotiations are completed. The motor is horizontal, with two cylinders, and can be constructed on the exact lines of the model, from one to twelve horse-power, according to requirements of any vehicle from a tricycle to a delivery van. A new system of electric ignition, forming part of the patent, has been adapted, and the sparking arrangement is regulated by a special cam attached to and worked by the motor, by which the speed can also be varied independently of the gearing.

The exhaust valves are also regulated by the motor itself on an entirely new principle. Another important improvement has been introduced in the exhaust box, attached immediately behind the motor, and at the back of the quadricycle, the noise being reduced to a minimum.

A very small carburetter is used, which forms one of the principal items of the patents. Through this carburetter a small quantity of petroleum (70 specific gravity) is sucked and vaporized, then mixed with air, so as to consume the minimum quantity of petroleum.

The ends of the connecting rods run continually in a "bath of oil," which is completely closed, and no fear of "gripping" need be entertained when on a long stiff incline the motor is giving out its full power.

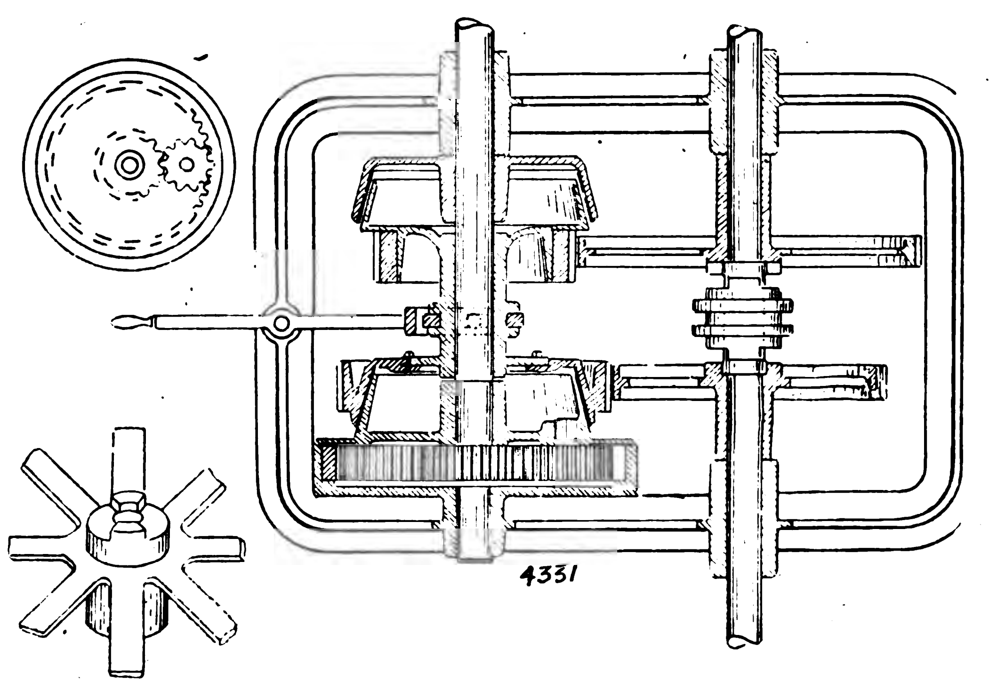
A small pump is kept in constant action by the motor to circulate the water round the cooling jacket, so that only a reduced quantity of water is necessary, a change from overheating being absolutely required only after a straight run of about seventy miles.

The motor complete with fly wheel only weighs 150 pounds for four horse-power running at 800 revolutions per minute.

The New Riker Electric Traps.

The Riker Electric Motor Co. are now showing a new model electric trap, which in design and general appearance must be pronounced the handsomest of its class.

The vehicle weighs 1,810 pounds, carries four or five dos-a-dos, and has an unusually wide body, measuring 41 in., while the gauge is 4 ft. 9 in. The length of the wheel base is



TRANSMISSION MECHANISM, R. L. MORGAN, WORCESTER, MASS.

ELECTRIC TRAP.—RIKER ELECTRIC MOTOR CO.

LACOSTE QUADRICYCLE.

5 ft. and the height of the frame above the ground 16 in., the gear case approaching the ground within 8 in. The frame is constructed of 1¼ tubing. The tangent-wire wheels have 5 in. hubs and 3 in. pneumatic tires. The rear springs are special elliptic, built for the purpose, and the front are reverse elliptic joined in the center and attached to the axle close to the hubs and to the body at the side frame. Therefore no trussing of the axle or body is required.

Ball bearings are employed throughout. The steering heads being inside the front hubs, are directly over the tread, hence there is no tendency to twist tne wheels awry or knock the lever out of the steerer's hand. The vehicle can be guided with two fingers. No gears are used in the steering mechanism. The lever comes back from one of the steering heads and connects with the cross lever, connecting then with the other steering head lever, which is lengthened to connect with a cross lever fastened to the vertical steering rod.

The body is of whitewood and the frame of oak. A curved dash-board rises to the height of 9 in. in front.

The batteries, of the Riker company's own make, weigh 750 pounds, including the crates, of which there are four, each containing 9 cells, and each cell weighing 19 pounds.

The capacity of the battery at a 10 hour rate of discharge is 150 ampere hours, and at a 4 hour discharge 120 ampere hours, giving a mileage on a smooth street or hard macadam road of 50 miles, and over ordinary country roads a mileage of 25 miles with five passengers, taking hills requiring a discharge of 100 amperes.

The motor, of 2 Kilowatt capacity at 1,000 revolutions, weighs 142 lbs., and is capable of sustaining 100 per cent. overload foi one hour without injury. It is geared to the rear axle by a single reduction, 9 to 7, and is claimed to be absolutely noiseless at highest speed.

The approximate speeds of the vehicle are 3, 6, 11 and 15 miles an hour—according to the condition of the road, the lever by which they are obtained being seen on the left-hand side of the seat. Pushing the lever ahead sends the vehicle ahead, pushing it back of the vertical reverses motion, but in order to get this reverse motion it is necessary to push a button in the handle of the lever and thus unlock it. This arrangement avoids confusion and mistake on the part of the operator. Two reverse speeds, 5 and 6 miles, are afforded.

In order to charge the batteries all one need do is to connect with a source of supply—it is not even necessary that he know the positive from the negative—and when the batteries are full they cut themselves off automatically. In case the operator puts on brakes before cutting off the current, the current automatically cuts itself off and can only be reconnected by returning the controller handle to "stop."

On the dash-board is a meter showing the amount of current in the batteries.

An automatic curcuit breaker under the seat disconnects the batteries from the motor if more than 500 per cent. overload is put on the motor. This is reset by returning the controller handle to "stop."

Under the cushion of the seat is a lock switch, controlled by a key, which disconnects the batteries so that the carriage cannot be run off by thieves or mischievous persons. There is also an electric alarm bell operated by the foot and electric lamps supplied from the batteries.

The Riker Electric Motor Co. have a number of orders for this and other types of electric vehicles, including delivery wagons and victorias.

Storage Batteries for Motor Vehicles.

The subject of this heading, and especially that of private locomotion by electrical means, is of greater importance to the profession than most electrical engineers would suppose. But, without anticipating in this direction, we have set about the solution of the problem in accordance with the rules of common-sense, and with due consideration of certain technical and scientific facts which have an important bearing upon the question, and which—though to some they may be novel—are by no means of a recondite nature?

We will not waste our space by insisting upon points which are not only obvious but are universally admitted; the necessity of durability, of a comparatively high rate of discharge—even a very high rate for short periods of time—and of a high ratio of capacity to gross weight of accumulator. Nor is it necessary to point out that, so far as our present knowledge extends, lead active material, and, in the case of the peroxide plate at least, lead supports are alone available. But lightness in proportion to energy stored being a *sine qua non*, it appears to us sufficiently obvious—though the point may not be universally conceded—that light, i. e., thin, lead supports must be used in the construction of accumulators for traction, and more especially in those intended for private locomotion. The views which have been, and may be, advanced in a contrary direction involve the acceptance of an unnecessarily high resistance and current density--two conditions which should be carefully avoided.

Admitting, as we do, that thin lead supports or plates must be used, two of the most serious difficulties in the solution of the problem crop up, clearly and distinctly, to overcome us or to be overcome by us. Nor need we waste endeavor or minor points while these more vital obstacles oppose us. Difficulty number one is that in the case of plates of any ordinary size, and of thickness varying, say, from twenty-five to seventy-five miles, the conductivity under ordinary conditions is insufficient to allow of a high rate of discharge, or of charge, if the whole, or anything like the whole capacity of the elements is to be utilized; in other words, when contact with the plate is made in the usual way along a portion of its upper edge, the distribution of the electro-chemical action over the surface of the plate becomes so irregular at high rates of charge and discharge that the upper half of the element becomes fully charged or discharged long before the lower portion has reached the same condition. Difficulty number two is simply that lead plates, perforated or unperforated, of the specified thicknesses, are, under ordinary conditions, altogether deficient in durability in the case of the peroxide of lead element. Provided the former difficulty is overcome, sheet lead of the thickness of twenty-five miles is quite effective and practicable in the case of the spongy-lead element, and with ordinary care will last for an indefinite period. Whereas, in the case of a peroxide element, a plate or support of the specified thickness may become eaten through and destroyed by corrosion within a period of three weeks, even when every cause of corrosion other than the local action which normally occurs between the peroxide of lead and its lead support is carefully eliminated. With sheets of less extreme tenuity, the durability rapidly increases as the weight per square foot is augmented; but the means here indicated for obtaining a moderate degree of durability are precisely that from which, under the circumstances, we are precluded. It

appears evident, therefore, that unless this difficulty also can be overcome—unless the local action can be obviated or sufficiently diminished, or unless a convenient and inexpensive system for replacing at intervals the peroxide element can be devised—the problem of obtaining light accumulators for private locomotion cannot obtain a satisfactory solution.

The question arises whether energetic means should not at once be taken to surmount these difficulties, or to ascertain that they cannot, at the present moment at least, be overcome. But supposing they have already been overcome, and very completely overcome, by some patient electro-chemist, with little time or care for self-advertisement, toiling day after day and year after year to solve problems such as the above, the future importance of which he has been able to foresee. We do not say that this has actually occurred, for we have not personally investigated the question. But we do say that much quiet and steady work has been expended in the endeavor to overcome the difficulties above referred to, and it has been claimed that these endeavors have in both directions been successful. It appears to us, moreover, that, whether this claim be well-founded or otherwise, our captains of industrial enterprise, our great manufacturers and our foremost electrical engineers, are not sufficiently in touch with the more or less secluded laboratory workers. It is futile and irrational to say, "If a man has an important improvement, why does he not make some batteries and demonstrate his invention to the world?" The man is not necessarily himself a manufacturer; the demonstration may to him be possible only on a small scale, although it may be readily susceptible of confirmation on a large scale. There are but few competent electro-chemists; has any one of them been invited to co-operate in an undertaking which, if practically solved, would bring a flux of work to hundreds of engineers?

In other directions, we think, electrical engineers have boggled over a problem which otherwise might, ere this, have been brought within the domain of practice. It has been stated, with some weight of authority, that "a battery that can work for only two or two and a half hours must be almost useless for motor cars and carriages," and that "a five-hours' run without recharging is a necessary condition for commercial succcess." Now, from statements such as these we must totally dissent. We have a strong opinion as to the expediency, in commercial matters especially, of beginning at the beginning, of attempting the simple before the complex, of meeting the smaller before proceeding to satisfy the larger demand. Moreover, we have observed that when paterfamilias—whose semi-detached villa is not very far from an electric supply station—takes his spouse for the usual Sunday afternoon drive, the time occupied by the latter is usually well within two or two and a half hours; and Mr. Walworth, who no longer enjoys a bicycle ride as he used to do, and whose business requires to be in the vicinity of Victoria Street from 9 a. m. till 6 p. m., has himself impressed upon us that an auto-motor that would take him to and from his work would be to him a convenience and a boon. It is in a multiplicity of such small requirements, carried into effect with a comparative readiness which is satisfactory both to buyer and to seller, that a great industrial application, developing and extending from year to year, may best take its rise. It may be likened to a great river derived from a multitude of small and apparently insignificant streamlets. We do not undervalue the recent achievement which goes to prove that nine hundredweights of Faure-King cells can convey a traction weight of one ton (including the cells) over a distance of from twenty-nine to thirty-six miles. But for various reasons this result does not appear to be a center of growth; and one of the reasons may be that we have fallen into the error of beginning at the wrong end, and of attempting to run before we were certain of our power of walk.—*Electrical Engineer.*

To Prevent Waste of Power by Motormen.

J. R. Cravath, Chicago, Ill., has invented a current recorder for registering the amount of electric current wasted by motormen in charge of motor cars or carriages.

It consists of an oblong wooden box 35 inches long by 2¼ inches by 2¼ inches, in which a thin strip of alloy 17 inches long is placed vertically in a groove and is supported by a short piece of German silver wire of such cross-section as to be heated by the current which flows through it to operate the car. The strip of alloy is held against the wire by a weight clamped to the lower end of the strip. When the temperature of the wire has reached a certain point, due to the passage of the current through it, the wire melts its way through the alloy strip, thus allowing the strip and weight to descend. There is also an automatic short-circuiting device, as a precaution, to prevent injury to the recorder or the stoppage of the car should the hot wire melt under an abnormal current.

The recorder, supplied with a new strip of alloy, is locked and given to the motorman at the beginning of each run, and is placed by him in the case fixed to the car; at the end of the run he returns the recorder to the office. The act of pushing the recorder into its case closes the car circuit through the recorder. Unless the recorder is in place the circuit is open and the car cannot be started.

The record kept in the office for each man is the number of miles run and the number of inches of metal melted, the recorder giving merely a comparative record of the performance of each motorman, as it does not record except when an excess of current is used. At end of the month a bulletin is posted showing the performance of each man. Careful tests of this device recently made are said to showed a saving in power of 9 per cent. after the recorders had been in service about two months.

R. L. Morgan's Transmission Device.

This carriage, which was illustrated and partially described in our April issue, has a very simple transmission device, herewith shown. It consists of two leather cup frictions connected direct with gears to the countershaft, the reverse motion being obtained through the internal gear shown. The speeds ahead are controlled by the positive clutch. By this means are secured two forward speeds and one reverse.

COMMUNICATIONS.

Work of the Electric Hansom in New York.

PHILADELPHIA, PA., Aug. 3, 1897.

Editor Horseless Age.

DEAR SIR: The results of the operation of our station in New York, which was put into operation March 27, 1897, and which we believe is the first and only one in the world, are as follows:

Total mileage to Aug. 1st	14,459
Average mileage for 12 hansoms	1,215
" " " 10 " (the number in actual service)	1,446
Average mileage per day per vehicle	11
Total number of passengers carried	4,765

The total number of accidents and delays of all kinds since the introduction of the service to Aug. 1 was 40, or about one for every 360 miles, which we think will compare favorably with the records for horse service.

When the novelty and difficulties of the service are considered and the necessity of employing comparatively inexperienceddrivers, this record becomes quite remarkable and demonstrates at once what perfect control the driver has over the vehicle, and the future reliability of the service.

While we do not care to publish the actual receipts and expenditures for conducting the service, we would say that the results have been so satisfactory as to warrant the organization of a new company with a large capital stock for the purpose of manufacturing and operating electric motor vehicles of all styles, and that the construction of 100 additional electric hansoms will be begun within the next thirty days.

Yours very truly,

ELECTRIC CARRIAGE & WAGON CO.

Morris & Salom.

The Willard Storage Battery for Motor Carriages.

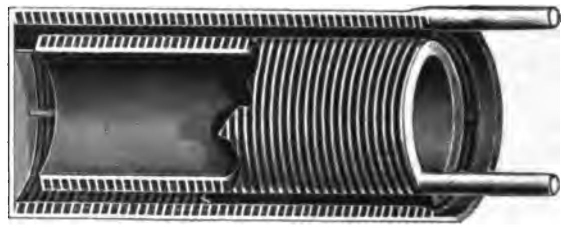
We present to our readers this week a cut and short description of a special type of storage battery for motor carriage work, manufactured by the Willard Electric and Battery Company, of Cleveland, O., whose long and successful experience in manufacturing batteries for other purposes has led them to enter this new field.

This battery is made on a new and original plan. In its construction the principal points sought for were lightness, ease and cheapness of renewals. It is said that renewals can be furnished for much less than any other battery made and the renewing of a complete battery can be done by a novice in a very short time.

The elements are made in the form of cylinders, the positives placed inside the negatives. The positives are protected by the well-known Willard corrugated, perforated insulating cell. Each positive is completely encased in this hard rubber cell, which renders short circuiting an utter impossibility.

These round elements are mechanically grooved and electro chemically formed, The negative element is grooved on the inside of the cylinder and the positive, which goes inside the negative, is grooved on the outside.

The usual capacity of the cylinder or cells is 30 amperes each, the cell being 2¼ inches in diameter by 9 inches long. In a 600-pound battery two of these cylinders are connected in multiple and 40 in series, making a 60 ampere-hour battery.



When it is necessary to examine the positives or renew them it is only necessary to pull the positive elements up out of the cylinders as candles are pulled out of a candle mold. The same elements can be replaced in the same way, or new ones put in. There are no hard rubber containing cells used with this battery. The negative element, which has its active material formed on the inside surface, constitutes the containing cell. A large item of expense is done away with in this way, as hard rubber is very expensive. The cells are insulated from each other by being placed in sections in hard wood cases and sealed in with a special cement.

The weight of a 90 ampere-hour battery of this type is 18 pounds, and it can be discharged at any rate desired without injuring the elements.

It is manufactured under broad patents owned by the Willard Company and all batteries are sold under a guarantee as to life and efficiency.

The New Duryea Launch.

The Duryea Motor Wagon Co. have lately launched a 20-ft. launch driven by one of their vehicle motors. The trial trip showed a speed of nearly eight miles per hour in spite of a hot box which prevented proper working. After sufficient use to get the bearings in shape, it is believed that a speed of ten miles will be easily maintained.

The motor lies flat in the bottom under a seat and weighs, with fly wheel, under 150 pounds. The reversing gear is quite simple and occupies but little space. All exhaust gases and dors pass out through the stern. The noise of the exhaust is so thoroughly muffled as to be hardly perceptible. The motor is fully balanced and runs without perceptible vibration. Sufficient tank space is provided for fuel for a 500-mile run. In appearance it looks not unlike an electric launch, but its light weight, high speed and long range really put it in a class by itself.

Mr. Pennington's Movements.

E. J. Pennington has returned to England, taking with him the machines he brought over. Previous to his departure he is said to have brought suit against the New York *World* for libel, claiming $100,000 damages in consequence of an article relating to him and his inventions which appeared in that daily during his sojourn in New York.

Mr. Pennington intends to repeat his visit soon, when he will complete arrangements for the manufacture of his vehicles here.

Australasian Patents.

J. F. Duryea, of 70 Montrose Street, Springfield, Hampden Co., Mass., U. S. A., for "Moto: vehicles."

G. B. Shephard, of Odgensburg. County of St. Lawrence, State of New York, U. S. A., for "rotary machines."

M. A. Beckett, of Berwick, Victoria, for "An improved tire for wheels of velocipedes and other road vehicles."

C. Guahari, of 70 Milkwood Road, Heane Hill, London, England, for "Improvements in generation of motive power."

H. Symes, of Alexander, South Otago, New Zealand, for "Improved method of and mechanism for propelling vehicles."

G. T. Booth and W. Scott, both of 61 Cathedral Square, Christchurch, Canterbury, New Zealand, for "Improved cycle propelling mechanism."

J. P. Erie, of 1900 East Fifth Street, City and County of Los Angeles, State of California, U. S. A., for "Improvements in motor vehicles."

D. Morgan, of 70 Elizabeth Street, Launceston, Tasmania, for "Improvements in all wheels used for vehicles, velocipedes, bicycles and the like."

C. M. Murison, of 2 Commercial Chambers, Manse Street, Dunedin, Otago, New Zealand, for "an improved driving chain for bicycles and other machines."

J. Barrett, I. Stevens and J. Sutherland, all of Hopetown, Victoria, for "an improved chain belt and wheel applicable to cycle and other chain driving gears."

J. F. Duryea, of 70 Montrose Street, Springfield, County of Hampden, State of Massachusetts, U. S. A., for "improvements in hydro-carbon or gas engines."

A. Menesdorffer, of Dally Street, Northcote, Victoria, and E. C. Elliott, of 377 Collins Street, Melbourne, Victoria, for "Improved band driving gear for transmitting power."

W. Muirhead and H. Wilkinson, both of 169 Queen Street, Melbourne, Victoria, for "Improvements in brakes applicable to velocipedes, cycles, motors and other wheeled vehicles."

C. P. Clere, of 28 Rue Grange, Bateldiere, Paris, France, and A. G. Pingault, of 38 Rue du Chemin, Vers, Paris, aforesaid, for "Improvements in or relating to apparatus for electro propulsion."

P. J. Winch, of 19 Hindley Street, Adelaide, South Australia, and J. T. Snell, of 150 Rundle Street, Adelaide, aforesaid, for "An improved method and composition for making pneumatic tires puncture proof."

A. Pulbrook, of 8 Union Mansions, Queen's Club Gardens, West Kensington, County of Middlesex, England, for "Improvements in or connected with pneumatic tires for the wheels of cycles and other vehicles."

A. Menesdorffer, of Dally Street, Northcote, and E. C. Elliott, of 377 Collins Street, Melbourne, Victoria, for "Improved mechanism for transmitting and increasing the power in rotary and other motion, also applicable to other purposes."

E. Waters, attorney of the Anglo-French Motor Carriage Company, Ltd., of Digbeth, Birmingham, England (Assignee of E. Gascoine, of Maidstone, England, and C. D. Courtois, of Chateau d'Ardon, Leon, France), for "Improvements in horseless carriages."

Messrs. Phillips, Ormonde & Co., Consulting Engineers, Patent and Trade Mark Agents, 169 Queen Street, Melbourne, Victoria, Australia, supply us with the following specially prepared list of applications for letters patent in Australasia in connection with motor vehicles and the like.

FOREIGN NOTES.

The Peugeot Co. are now employing nearly 300 hands.

The Daimler Motor Co., Coventry, England, now have 300 men in their employ.

The French tax on motor vehicles has been raised from 10 to 20 francs per annum.

In Belgium motor vehicles are not allowed to be driven by persons under 18 years of age.

Gautier, Wehrle & Co., Paris, are enlarging their premises, owing to the popularity of their vehicles.

M. Clement, the well-known bicycle and motor manufacturer of Paris, is building a new plant to cost $600,000.

Two French gentlemen have just completed a journey of 2,480 miles in a Panhard motor carriage without a mishap.

The Central Engineering Works Co., of York, England, are increasing their capital to take care of their growing business.

The Compagnie Generale des Cycles, 7 rue Darboy, Paris, are preparing to manufacture De Dion tricycles in large numbers.

Georges Richard, 12 rue Theophile Gautier, Paris, is manufacturing a light Benz carriage, seating two or three persons and propelled by a 2-horse-power motor.

The Post Office authorities at Paris are about to introduce electric wagons for carrying the mails. These wagons will go about 13 miles on one charge and will carry a load of 1,800 pounds.

Advices from England state that the assessment of H. J. Lawson, chief promoter of the British Motor Syndicate, has been raised $5,000,000 in consequence of his profits in that speculation.

M. Sevin, a Parisian school master with an eye to the future, has started a school of auto-mobilism to give instruction to motormen and others desiring to learn the practical points about the motor vehicle.

Roots & Venables, manufacturers of the "petrocars" frequently referred to in our columns, are incorporating their business under the title "The Roots' Oil Motor and Motor Car Co. Ltd.," with a capital of £30,000.

The London Motor Car Works Co. Ltd., Albert Mills, Beavor Lane, Hammersmith, London, W., have fitted up a plant for the manufacture of motor vehicle parts, such as ball bearings, axles, hubs and controlling gears.

It is reported that a company is to be organized in England to manufacture the Serpollet steam carriages. The light three-wheeled type recently illustrated in The Horseless Age is said to have proved unsatisfactory, and the inventor's attention is now directed solely to the heavier class of vehicles, chiefly omnibuses, 60 of which he is now constructing for urban use.

The business of Panhard & Levassor has been turned over to a limited liability company with a capital of 5,000,000 francs. The name of the new company will be the Société des Anciens Etablissements Panhard et Levassor, the directors being M. René Panhard, M. Hippolyte Panhard, M. G. A. Clément, M. Descubes, M. René de Knyff, M. G. Pierron, M. Garnier, and M. Daimler. Panhard & Levassor are reported to have sold 4,000,000 francs worth of carriages last year. They are a year behind orders and have raised the price of their vehicles.

The Automobile Club now has over 1,000 members.

Paris, Singer & Co., Clapham, London, S. W., England, are manufacturing oil motors for vehicles in half horse power and four horse power sizes.

The Beebe punctureless pneumatic tire is now being manufactured by the Beeston Pneumatic Tire Co., Beeston, England, in sizes for motor vehicles.

The Berlin (Germany) Omnibus Co. has given an order for an experimental electric omnibus of ordinary seating capacity. If this is satisfactory the whole line will be equipped with them.

In France a motor vehicle is being constructed which is 24 feet 6 inches long, 8 feet wide and 8 feet high. It will be drawn by a 30 horse-power De Dion steam tractor and will be used for touring.

A new company called the Société Francaise d'Automobiles has been formed at Puteaux, near Paris, France, to manufacture a light two-seated carriage fitted with a three-hp motor invented by M. Gaillardet, formerly with De Dion & Bouton.

The Prefect of the Police of the Department of the Seine, Paris, has signed an ordinance governing the use of motor vehicles, which covers 270 pages and requires the name of the owner to be given as well as a minute description of the vehicle.

M. Bixio, manager of the Compagnie des Petits Voitures, Paris, which has been promising to introduce a system of motor cabs for some time, states that the company is now engaged upon two experimental cabs, one electric, the other gasoline, the former being preferred for this service.

Mr. Stanislaw Grodzki, of Warsaw, Poland Russia, is the owner of a Peugeot motor carriage in which he recently rode from Warsaw to Paris to witness the Paris-Dieppe race. Mr. Grodzki is a subscriber of THE HORSELESS AGE, and is taking a leading part in the introduction of motor vehicles into Poland and Russia.

Motor vehicles have been introduced into Algeria, where the roads are said to be well-adapted to their use. A line of motor stages have been put on between Oran and Mastaganem, displacing the old horse diligences. M. Cafferet, a French engineer resident at Oran and member of the Touring Club of France, is responsible for the change.

H. Van Meerten, late chief constructor of the Dutch navy, writes from Buitenxorg, East Indies, advocating the adoption of the metric system by American technical journals and recounting some of the annoyances he has experienced in purchasing American goods from specifications expressed in the confusing English system of weights and measures.

At the exhibition of laundry machinery held at the Agricultural Hall, London, recently, 12 motor vehicles were exhibited by the following makers: The London Electrical Cab Co., London Motor Van & Wagon Co., Daimler Motor Co., and the Great Horseless Carriage Co. The Daimler Co. showed a vehicle with two detachable bodies, one for business, the other for pleasure.

The proprietors of the Grands Magasins du Louvre, Paris, opened a competition this year for the best design of a motor vehicle on lines laid down by them. The passengers were to be protected from the sun and rain. Twenty-five designs were submitted, but the judges declined to award the prizes, contenting themselves with honorable mention in half a dozen cases. The models were more bizarre than practical.

A motor vehicle company is said to be forming at Amsterdam, Holland.

A wealthy Chinaman of Pekin has ordered a motor carriage of a French manufacturer.

Quite a number of motor vans are said to be in course of construction for South African fields.

De Dion & Bouton are about to bring out a new carriage driven by a two-cylinder horizontal motor.

The French journals, friendly to the motor vehicle, are keeping track of the accidents, fatal or otherwise, happening in France, which are due to horses.

Barthelemy & Co., 11 Passage du Bail, Paris, are doing a thriving business in motor carriages, using the Panhard & Levassor motors and constructing their own gears and bodies.

Among recent English patents are: No. 9,143, granted to John Bradley Carse, of Chicago, on an improved water jacket for gas engines, and No. 26,615, granted to J. Frank Duryea, Springfield, Mass., on an improved driving mechanism for motor vehicles.

Baron Rogniat has imported one of the electric hansoms of the Electric Carriage & Wagon Company, New York, into the French capital, perhaps with the object of spurring on the French builders of electric vehicles, who have as yet failed to provide a suitable public cab service for the Parisians.

Motor Vehicles in Warfare.

In an article discussing the above subject in *La Revue Technique* Col. Fix examines the requirements and conditions which must be met in order to achieve success.

Since all military vehicles must be both solid and simple, many features which might be otherwise acceptable must be omitted, says the *Engineering Magazine*. Roads which in time of peace are good soon become neglected and demoralized in time of war, and a vehicle, like a soldier, should be able to accommodate itself to all inconveniences. Tires of rubber, whether pneumatic or solid, are inadmissible, both because of the greater weight to be carried and because of the rough usage to be endured. Iron tires alone meet the requirements, and, in view of the great torsional strains, the hubs should be larger than they would otherwise need to be, while, in order to clear surface obstacles, the diameter of the wheels should not be less than that now found in field artillery.

Electricity is barred as a motive power, on account of the impracticability of charging accumulators in the field or en route, and steam or petroleum motors alone remain; between these steam having the preference, at least for greater powers, since the petroleum motors at present are not satisfactory above ten horse power. Practically a motor vehicle for military service must be a carefully designed steam traction engine, planned to haul artillery and supply trains anywhere where horses can go; the questions of speed and personal comfort, so important in pleasure vehicles, need hardly be considered.

Col. Fix shows some very interesting figures relating to the cost of horses in military service, and makes out a strong case for the side of the machine, and it is not at all unlikely that motors in warfare may soon enter the field service as extensively as they have already entered other departments.

Steel Highways Being Introduced.

In accordance with the desire of the Secretary of Agriculture to promote more extended experiments in the use of steel track ways on wagon roads, the office of Road Inquiry has made arrangements with the Cambria Iron Works, of Johnstown, Pa., for rolling special rails for the purpose, these arrangements to go into effect as soon as definite orders from responsible parties amounting to one mile of track are received.

The director of Road Inquiry and the engineers of the iron company, after much discussion, have agreed upon a plan of track which promises to meet all requirements. No wood is used in construction and no cross ties for support. The track consists of a simple inverted trough or channel of steel for each wheel, with a slightly raised bead on the inside to guide the wheel, each channel resting on a bed of gravel and the two tied together occasionally to prevent spreading. Special devices for remounting are provided at each joint.

The bearing or tread for wheels is eight inches wide, the thickness about seven-sixteenths on an inch. The weight of the structure is about 100 tons per mile of single track road, and it will be furnished in small sections at the rate of $3,500 per mile. Instructions for laying and assistance where practicable will be furnished by the office of Road Inquiry; orders for track should be sent to the iron company.

The first order for track has been given by the New York State Agricultural Experiment Station.

The opportunity to promote this experiment commends itself to all experiment stations, as of interest to agriculture; to all manufacturers of steel and vehicles, especially horseless wagons; to all turnpike companies needing an increase of traffic or a decrease of maintenance expense, and generally to all officials and citizens engaged in improvement of the highways.

Full details or plans and an account of experiments already made will be furnished upon application by the office of Road Inquiry, Washington, D. C.

We append a letter from F. Melber, engineer and contractor, Standard Building, Pittsburg, Pa., giving his experience with steel roads:

"My road is now in position since about a month and among other interesting things, I watched the temperature of the steel when exposed to the hot afternoon sun. Every steel worker knows that steel bars lying in the yard of a bridge works, for instance, will get so warm in a few minutes that the men cannot hold them in their hands. I find that my steel stringers remain cooler than the adjacent broken stone. This, I think, is as well a remarkable as an important fact, and it goes to show that there takes place an interchange of the temperature between the inner substances and the steel and that in this class of steel highways we do not need to provide for expansion.

"Altogether I find the steel road to verity all I have said about it, even as to cost, and with regard to traction advantages I am now able to give figures. I have made twenty trials, using a gauged spring balance, and find that the average force needed to pull the iron wagon weighing 1,550 pounds, with a 16-foot wagon-bed (shown on the photo) is 2.5 pounds, which, reduced to a load of 2,000 pounds, means a traction force of 3.23 pounds per ton. On page 18 in your pamphlet on tests in Atlanta, you arrive at an average tractive force of 41 pounds for good macadam and you place the traction for hard earth roads with Morin at from 75 to 102 pounds, in the mean, say 88 pounds; my tests therefore demonstrate that the steel roads need for traction 1-12 the power as compared with macadam and 1-27 the power as compared with earth roads."

A Trolley Omnibus.

There is now in operation at Greenwich, Conn., an electric omnibus which runs on the road without rails, being supplied with current from an overhead wire, and while such a system is not of general application it is thought that there are many cases in which it can be successfully installed to replace horse omnibuses on country roads, as between a small town and a railway station, a few miles distant. The carriage was formerly driven by storage batteries. It is mounted on four wheels, having pneumatic tires, and the forward axle is driven by the motor, which is connected with the brake, so that as either one is put in operation the other is thrown out. The current is supplied to two overhead trolley wires—one outgoing and one return wire—8 in. apart, which are suspended from a third wire by triangular metal frames. The "trolley" device consists of a set of rollers running on one or other of the two main wires, and so attached as not to fall off or run away when the carriage is descending a hill. This is attached to a double wire, which passes over the top of a pole at the back of the carriage, and the end of which is wound on a spring drum on the carriage. If the carriage crosses from side to side of the road the wire is paid out, the spring drum keeping it taut. The poles for the overhead wires are 150 feet apart, and they are partly on one side and partly on the other side of the road, but there is no trouble with the contact device where the wires cross the road. The present run is a quarter of a mile, but the distance is to be extended from the town to the railway station, one and a half miles, the town having refused to allow the construction of an electric tramway on this road. The run of a quarter-mile is made in forty-five seconds, but the object of the experiment has been to obtain convenience rather than speed. The carriage can run in either direction, turn round, and move across the road to avoid other carriages. Two carriages can be run, having trolleys on the two wires. The carriage is practically noiseless, and is equal to a two-horse omnibus.

The vehicle is the invention of Henry Von Hoevenburgh, an electrical engineer of New York.

Loss of Heater Efficiency in Gas Engines.

Mr. H. C. Fairbanks, of Sibley College, while reconstructing a gas engine, observed a singular though probably not exceptional phenomenon which, so far as known, has not been previously described. The machine exhibited a great loss of heater efficiency, which was unaccounted for and was not affected by any changes made in the process of general repair. Finally it was suspected that the conductivity of the metal of the cast iron "fire pot" had been impaired by oxidation or otherwise, and it was replaced by a new one. The engine at once started off at full power and regained its original efficiency.—*Electrical Engineer.*

Sir David Salomons on Motor Traffic.

(*Continued from page 16, June issue.*)

THE POWER OF THE ENGINES.

I will now turn to the question of the power of the engines to be placed upon motor vehicles. It cannot be too strongly impressed upon those who intend to take advantage of this class of traffic that the following conditions are essential for success:

(1) That whatever is the proposed speed decided upon, it should be calculated upon the assumption of being an average speed, whether the country be level or hilly and the roads good or bad. Climatic changes must also be taken into consideration. Thus, if for a light vehicle, weighing when laden, say, one ton, twelve miles per hour has been fixed upon for the speed, then the power carried should be sufficient to run at this rate in all weathers and over al highways, and to climb every hill with a maximum ascent of, say, one in ten, at the proposed rate. The vehicle should also be able to mount a hill of one in five, but at a less speed.

(2) That the mechanical construction shall be such that any intelligent man after a few hours' practice shall be able to manage it.

(3) That there shall be nothing about the carriage likely to prove a danger to the occupants or the general public.

(4) That the vehicle shall be strongly made, and no part likely to wear out quickly.

(5) That dangerous fluids and fuels be excluded as far as possible.

(6) That the construction be such that when repairs become necessary they can be carried out either temporarily or finally by any intelligent village smith.

In respect to the above considerations, there is only one which needs special comment. It is evident that the power required to obtain a given speed on the level and down hill needs no consideration, for if the engine is strong enough to mount hills of one in ten ample power exists to do the rest. I have come to the conclusion, from experiments and practice, that for every ton not less than 10 horse-power should be carried. This does not necessarily imply that a 10-hp engine is required. It means that the engine shall, for considerable periods, and without injury to itself, be able to give off 10-horse power. It must be remembered that when the carriage is started, a far larger amount of power is necessary than when it is running. It is therefore very important to have a good reserve. I have examined with close attention probably by far the greater majority of the benzine motor carriages in existence, and have ridden in a large number of them. I think it is quite unnecessary to give scientific evidence to disprove the various clap-trap which has been put before the public by company mongers, in the hope of drawing money. Statements as to 60 miles per hour and a variety of other nonsense needs no comment. Any one present is capable of running a carriage strongly made at 60 miles per hour, without a motor, and without a horse, by merely starting the vehicle down a long, steep hill! In fact all statements as to speed in connection with motor carriages are worth nothing. There is no difficulty in obtaining enormous speeds with very small power, under favorable conditions. The real test is: Will the vehicle mount a hill, say one in ten, when the thermometer is 90° in the shade for a distance of five miles, at the respectable speed of 12 miles per hour? Any test short of this, supposing this speed is desired, should end in a decision to reject the vehicle as unpractical and probably worthless. You must not understand that I necessarily fix 12 miles for the rate, for many would be content with a lesser speed; and for haulage where vans and similar vehicles are employed, five or six miles per hour would be deemed sufficient on steep hills. It may prove of interest to give a few statistics, calculated by some of our greatest engineers. They were compiled with reference to haulage on roads in general, and the figures must not be accepted for self-propelled vehicles, for the many reasons already referred to, the chief one being that when the motive power is self-contained, the haulage factor must be multiplied two, three or four times, according to circumstances, but the tables will hold good for self-propelled traffic when the factors are multiplied by a constant.

Experiments made by Telford showed that draught for a wagon weighing about 21 cwt., was as follows:

	LBS.
(1) On well-made pavement	33
(2) On broken stone surface on old flint road	65
(3) On a gravel road	147
(4) On broken stone road on a rough pavement foundation	46
(5) On broken stone surface upon a bottoming of concrete formed of Parker's cement and gravel	46

Babbage has stated that the friction or resistance of roads are as follows:

Well-paved roads	[illegible] part of load.
Gravel road	[illegible] "
Fresh earth	[illegible] "

By his experiments the folllowing results were obtained:

Loose Sand	[illegible] part of load.
Fresh earth	[illegible] "
By roads	[illegible] to [illegible] "
Dry meadow	[illegible] "
Dry high road	[illegible] "
Hard macadam	[illegible] "

Telford's table gives in round numbers as the difference between the lowest and greatest figures a proportion roughly of one to four and a half. Baggage's table for equivalent roads by theory gives the ratio roughly one to two, and by experiment, taking hard macadam and a by-road as an equivalent comparison, the ratio is one to three. Striking a general average, it may be assumed that the power required to draw a vehicle over a good level road as compared with a level rough road would be four times greater in the latter than in the former case. Here is another table of considerable interest which deals with a stage coach. It may be observed how very close the figures are to those I gave in an article published some time since in *The Engineer*, although I had not seen the statistics in regard to the stage coach at that time.

With a stage coach weighing 18 cwt., exclusive of seven passengers, the following were the results:

Rates of Inclination.	Rates of Traveling.	Force Required.
1 in 20	6 miles per hour	268 lbs.
1 in 26	6 "	213 "
1 in 30	6 "	165 "
1 in 40	6 "	160 "
1 in 600	6 "	111 "
1 in 20	8 "	296 "
1 in 26	8 "	219 "
1 in 30	8 "	196 "
1 in 40	8 "	166 "
1 in 600	8 "	120 "
1 in 20	10 "	318 "
1 in 26	10 "	225 "
1 in 30	10 "	200 "
1 in 40	10 "	172 "
1 in 600	10 "	128 "

The following experiments may also be given as affording some further idea of the power required for haulage:

An engine drawing 18 tons on a fairly level road. Separate locomotive, 18 tons, when charged with fuel and water, must give indicative horse-power of 30 to reach speed four or five miles an hour.

Another engine, 12 tons, drawing 25 tons load, for same speed, 40 horse-power.

Another engine, 15 tons, drawing 32 tons, same speed, 50 horse power.*

Although the question of rapid mechanical traction has come to the fore after a lapse of about half a century, it cannot be said that the interregnum has been due to any failure in regard to this mode of traffic. It is right to point this out, because the French and Germans claim to have revived this class of traffic, and it has never been done before with success. The French also claim that the first self-propelled vehicle was made in France, by Cugnot. The latter point may be conceeded, but I claim that the English nation were the first to make really practical road carriages, as they were the first to construct railways, and that the early motor traffic of the period about 1830 was killed, partly by the attention drawn to railways, but in a large measure by the monstrous acts which were passed, dealing with the tolls to be imposed on them when traveling on the turnpike roads; and although these acts were modified at a later date, the definition of a locomotive, as laid down in the act of 1865, finally stopped the way until the passing of the act of last year. I have no hesitation whatever in saying that the steam coaches of Hancock, and of many other former designers, could be run to-day with perfect success, and that the only improvements we can now add to their designs are due to the better and cheaper material we have at our disposal. That this view is reasonable let me give you the parallel. Compare the locomotive of to-day with that of 1830. The improvements are those simply due to the increased demands placed upon the railway system. The general principles and design remain the same. It is mainly in detail and size that the alterations are to be found. To expect, as some people do, an extraordinary invention will sooner or later appear to render motor traffic on the highway a success, is simply rediculous. Not that wonderful discoveries may not be made, but I think that all engineers will agree with me that at the present time we have everything at our command to make this class of traffic all to be desired. The only thing now wanting is practice, with the relegation to the background of the company promoter. Our great manufacturers are perfectly competent to deal with the question, and it will be these firms which will not only survive, but will also bring the whole matter to a happy issue, in conjunction with such factories which may come into existence, placed upon an honest commercial basis, and as already stated, I do not believe there is any chance, as matters stand to-day, of benzine, oil, gas or electricity competing with steam, where real work is to be done with certainty. I should like to refer to the evidence given before the

PARLIAMENTARY COMMITTEE OF 1831.

Telford, Gurney, Macadam and others were witnesses. They appear to have agreed in regard to two points, viz., that the wear from the horse shoes was greater than that from the carriage wheels, and they also expressed the opinion that there should be one inch width in the tire for every ton carried, inclusive of the weight of the carriage. Of course we know the roads of to-day are not made in the same manner as they were at that date. We believe that our roads have been greatly improved since that time. My observations do not bear out the two points mentioned. I do not think that the general law of one inch width tire per ton must necessarily be followed up the scale. A proper width of tire for a carriage weighing one ton, I think, should be two inches instead of one inch; then add one inch for every ton up to say three tons. At this, the tire would stand at four inches, and on high-roads this is ample width for very much heavier weights. Then again in regard to the wear and tear due to horses' feet, I believe that the wheels do far more mischief, particularly in the case of a narrow road, as it will always be found that the ruts are the worst portion of the road, and not where the horses tread. Even on wide roads, the wear of the wheels appear to do the mischief. I am ready to take a different view if the road is practically perfection, and "quartering" is constantly taking place. Then the wheels will wear the road very equally. The remainder of the evidence before the committee tended to show that steam carriages were at that period a success and likely to continue so.

ELECTRIC TRACTION FOR CANALS.

I cannot refrain from pointing out a possible mode of traction, which appears to have been completely neglected. When the construction of railways was on the *tapis*, great opposition was offered to their construction, on the ground that England was well served with canals, and that the companies owning these would be greatly injured if the railways were made. I have in my possession copies of some remarkable letters which appeared early in the century on this subject. I have not the least hesitation in saying that if electric traction could be applied to the existing canals they would be made far more useful as well as more profitable to their owners. Electric traction could be applied in this case at a comparatively small expense, and it is worth while to have an experiment made on an extensive scale. For light traffic on railways the self-propelled vehicle has a fair opening, and abroad experiments are being made in this direction. One or more railways in Germany are making trials, also the Northern and other railways in France. For compulsory service, as in the case of postal mails, and for lightly laden night trains, the French Serpollet Company have constructed carriages to carry from 40 to 50 people, with a sufficient engine power to run at about 30 miles an hour for such purposes. It is estimated that the cost of running these compound carriages is about one-third the cost of an ordinary train, and the wear and tear to the permanent way is far less. On almost every railway system in England there must be an opening for this class of traffic. It may also be mentioned that these French steam carriages are capable of drawing one or two ordinary railway carriages, but at a reduced speed, say at 18 to 20 miles an hour.

THE REVIVAL OF MOTOR ROAD VEHICLES.

Without a doubt, a great many people are puzzled why self-propelled traffic has again come to the fore. In England this traffic has been going on unostentatiously for years, traction engine being largely in use, but their speed is so limited by law, and they are so surrounded by legal technicalities, such as a license necessary in every county, and taxed, that no advance could be made in the direction of light traffic. In residential districts these restrictions have proved a blessing. In France

* See "Fletcher."

and Germany, although there are laws affecting self-propelled traffic, they are far more lenient. The great success which cycling had in France, following upon the prize given by *Le Petit Journal*, which also gave so large an advertisement to that newspaper, led to the energetic proprietors offering a prize for quick self-propelled carriages, with the result which is so well known. Consequently the revival is not due to any new discovery or special invention, but simply that many minds were turned to the subject in the hope of gaining the large money prize. The French nation, possessed of a character highly enthusiastic, always goes to extremes. A perfect rage set in for the class of vehicle under consideration, and those who became possessed of these carriages, being wealthy, gave a great impetus to manufacturers. You have here in a nutshell the whole history of the revival of self-propelled traffic of the lighter kind. A great deal of agitation took place last year to obtain a satisfactory act of parliament, to enable the same freedom to be given in England as abroad for the use of motor vehicles on highways. It was generally expected that as soon as Englishmen obtained this freedom a great nuisance would be produced by the presence of vast numbers of motor carriages in the streets of towns. I never took this view myself, but always thought that the change would come slowly but surely. There is no doubt that the position taken up by certain of the motor companies has for the moment created a lull. Nobody when purchasing a carriage desires to buy a legal action at the same time. Tremendous opportunity is therefore offered for honest commercial companies to start at the present time, and I find that this fact is well appreciated in financial and commercial circles. The Society of Arts may be said to deal more largely with commercial interests than with any other. It has taken part in many of the great movements during the Victorian era, which have so materially increased the wealth of this country.

MASTER PATENTS.

I therefore feel that it is not altogether out of place to say a few words in regard to patents so far as they touch the particular question under consideration, as well as on patents generally, as they affect the manufacturer and the public. The present hesitation to take full advantage of the locomotives on the highways act, 1896, is due in a large measure, to the blemishes existing in our patent law, which enables any set of people to bully or blackmail, not by right but by might, the assumption being that the threatened parties will not fight. In dealing with the question of patents, it is not my wish to deliver a legal discourse upon the subject, and the numerous "ifs" and "provided" are omitted. My object is to give you a general view rather than a complete technical analysis of the subject. There is too much tendency in the present day to patent an article in the hope of it accomplishing something for which it was not intended. There is no doubt that our patent law does a good deal to prevent useful inventions being made in regard to any particular matter where a number of patents already exist. No man will turn his attention seriously to develop a piece of machinery where he thinks he may be stopped from reaping the harvest he may deserve, by finding that in some little detail a patent has already been taken out. That my view is correct is corroborated by manufacturers on all sides. It may be contended that the present law would permit him, notwithstanding, to work his invention, and no doubt this contention is true if the inventor can afford to enrich a number of lawyers first and hand his profits over to others. It is not the question of patents which I attack, but the method by which they are worked, and a great improvement could be made in this respect. Much of the advance which has taken place in foreign countries, to our disadvantage, has I think been due to defects in our patent law. Our patent law is evidently unsatisfactory. How could it be otherwise expected when the principle by which our governments work is to deal with these matters in a kind of political way and place men in charge of the work who as a rule know nothing about the special subject they have in hand? I could give innumerable instances of this process, but to do so would open me to the charge of personalities, which I am anxious to avoid, because I know well that those who carried out the work did so under instructions and to the best of their ability, often limited. All practical men will recognize that no patent in England is of value until there have been decisions in the law courts in regard to infringements, and that if a defendant instead of fighting gives way and perhaps pays agreed damages, the patent stands exactly where it did before the action arose, since it has not been upheld nor has it been overthrown. Again, if a good fight is made and the defendant loses, there is nothing to prevent another infringer being proceeded against, and he might be more successful in the action and overthrow the patent. Then there follows another injustice, that the first defendant who lost his case obtains no relief, although the patent has been declared invalid subsequently. Any article which is patented in England cannot be brought from abroad except under two conditions, firstly that the individual doing this is willing to pay what may prove to be blackmail to the holder of the English rights, or to submit to an action with the possibility of losing his case. The patented article moreover is liable to confiscation without claim for damages. This state of things, although it exists in many other countries, is eminently unjust and against the interests of the nation. I will give two instances bearing upon what I have said to show how unfair things are at present. A few years ago I took out a provisional specification for an improvement in keys. It was brought to my notice about a week or a fortnight later that another provisional specification had been lodged identical in charter. Indeed I learned the circumstance by pure accident. The question to decide was whether I had been anticipated or not. If so, it was not my intention to proceed any further. I then found that my specification had been lodged a few days—not a week—earlier than the other one, which had been entered in the name of some one living at Norwich and a stranger to myself. Here was a case of two persons hitting upon the same idea practically at the same time and each applying for a provisional specification which was granted to each within a week. The sole difference between the two specifications was that the Norwich application included watch keys, and this was covered in mine by using the words to the effect that the improvement was to apply to every form of key, for whatever purpose it might be used. According to common sense and equity the Norwich man ought to have had his money returned, which of course was not done. A second instance is the following: A desire was expressed to me by a gentleman living in France to give him all the information I could to render agreeable a proposed trip in England to be made in his horseless carriage. I wrote to him to say that if his carriage came under certain patents it might possibly be confiscated if it came to the knowledge of the owners of the English rights. Failing this, he might have to fight the matter out in Law Courts, and as neither of

these conditions were likely to render his journey to England pleasant, he had better ascertain from the makers whether anything about his carriage was patented in England, and if so, whether the rights were held in this country by hostile persons, and further to request the manufacturer to make arrangements for him with any holder of English rights to permit the carriage to enter without molestation. It appears to me that apart from the larger question, the following amendments should be made without delay in the patent law:

(1) If it can be shown by the applicant for a provisional specification or patent, within 12 months from the date of first paying the fees he has been anticipated, the fees shall be returned Provided he can show that at the time of application he was ignorant of the anticipation.

(2) That if in any action a patent is declared invalid in consequence of anticipation by the issue of a prior patent, the fees shall be returned. With the same proviso as in No. 1.

(3) That a patent shall become void, unless the present holder be registered.

(4) That English patented articles may be imported into England on the following conditions: That the individual so importing give notice to the Patent Office or some other selected Government department, of his intention to do so with a declaration that the article imported is for his private use, and that he shall deposit a sum equal to 10 per cent. of the cost of the article, which will be handed over by the Government department to the holders of the patent rights, and that the owner shall not be precluded from selling the patented article provided he does not import more than two in a given year, there being a *bona fide* understanding that the importations have not been made with a view of trading.

(5) That if a patented article enter the country for a short period with no intention of trading, that providing it does not not remain more than one year in England, the sum paid shall be 1 instead of 10 per cent.

(6) That in no case shall a patented article be liable to confiscation, but the aggrieved party may have the power of applying to the selected Government department who shall ascertain whether more than 10 per cent. shall be regarded as the fair compensation, the costs to be apportioned according to circumstances.

(7) That patented articles may be made by any manufacturer with the same freedom as if they were not subject to rights, provided that the manufacturer declare to the selected Government department his intention to manufacture, and that department shall inquire whether a royalty of 10 per cent. paid to the holders of the rights is deemed to be sufficient, and that the department shall not take into consideration the amount of capital which the holders of the patent may have invested in or watered their business, but determine the question simply on commercial principles. This condition may be said to exist now, but with insufficient freedom.

(8) That a patented article in the *bona fide* possession of a member of the public, *i. e.*, private person, shall not be confiscated under any conditions whatever, but in the event of the patentee gaining an action the damages shall be paid by the manufacturer, and if the goods are foreign the private individual may be called upon to pay 10 per cent. of the value of the article, unless he desires to defend an action with a view to upset the patent, in which event, if he loses, he shall be liable only for the costs beyond the 10 per cent. mentioned.

(9) That no back royalties extending beyond 12 months shall be claimed.

The above amendments are greatly needed, and if they could be obtained with possibly certain variations, considerable impetus would be given to British trade, apart from benefit to individual of the general public. It often occurs that a good invention is held by parties who are incapable or unwilling to manufacture, thus establishing the position of dog in the manger, simply to levy blackmail. A new manufacture which might employ many hands, and bring capital into the country is stopped for a number of years, and perhaps forever if the invention or inventions in question have been superseded before the expiration of the patents. It is well known that many inventors of a low type take out patent after patent in regard to various matters, few of which are really original; but the process is carried on in the hope that some one will be caught, sooner or later, in the net. It is a means of speculation most disadvantageous to the industry of this country. It must be evident that no inventor can sit down and solve problems with a pile of patent specifications at his side for continual reference. No man could produce useful work by such a process. It is therefore obvious that inventors should receive the greatest freedom, which can only be attained if patents are not granted for trifles according to the present system, and only after some kind of reasonable investigation. The present Government would do much good if they would look into the matter of this kind, which is affecting the employment of the working classes in a large degree, as well as the introduction of those economics which save the nation money. With a better patent law, opening for the employment of capital at home would be extended. Such subjects, which Ministers probably consider trivial, have a more far-reaching effect than the passing of party legislation, or a variety of other measures before the House, which a twelvemonth's delay would add to the peace of all parties. The patent laws can be made a blessing to the inventor and the public, or the reverse, according to their nature, and those of England partake rather of the latter character. At Liverpool I used the following words: "One opinion from which I have never swerved upon this question is, that no patent connected with self-propelled traffic is worth the paper it is written upon, whether the patents will bear the test of the law courts or not." The above remark was very rightly made use of by the majority of the newspapers when criticising the various companies which had been formed and were being formed about that period, and I was led to understand that those connected with the companies in question complained grievously of what I had said, it being contended by some of them that they held master patents and monopolies I think it therefore right to say something more upon this question, for to set up such untenable claims is unfair to the English manufacturer and to the English public. I intend, with your permission, to examine the whole question of patents more narrowly than I have done, and to prove that there is no master patent or monopoly whatever, which can apply to the construction of motor carriages generally, whether they be driven by steam, oil or electro-motors. I will not ask any one to go further than to consult a book published by the patent office, and which may be purchased for a shilling from any bookseller by giving the order. This book is the "Abridgements of Specifications, Class 7, Oil and Gas Engines, period 1877–83." Here will be found patents connected with the subject, all of which have now lapsed. There are other volumes of abridgements dealing with velocipedes, and with other matters, which also bear upon the subject, but the book mentioned is sufficient for the purpose, while if every de-

tail is sought for the original specifications can be consulted as well. I will first examine whether any claim can be made for a master patent, in regard to motor vehicles. The possession of a master patent would mean a monopoly on the part of those holding the rights. Let us see what a master patent means. Without entering into technicalities, it must be a "manufacture, useful, novel and ingenious." Consequently if the patent is a master one, this useful, novel and ingenious manufacture can only and solely be made under the patent specification, or, may be, under a group of such patent specifications. The patent might in certain cases be the embodying of some new idea of great value and novelty. To explain more clearly I will take the well-known case of the Edison-Swan electric incandescent lamp. Quite apart from the morality of the case we find a master patent (or rather group of patents), *i. e.*, a lamp of special form suitable for a definite purpose, which can practically be made in only one manner for commercial success. These patents are of the class termed a combination, which means a combination of old things to form a novel, ingenious and useful new one. Incandescent lamps can be made in other ways, it is true, but they have not the same value commercially. Hence the only lamp of practical value was covered by the patents, and was of a particular type, viz., a high resistance carbon filament in a practical vacuum, enclosed within a case of glass, hermetically sealed, with platinum leads passing through the glass, and the filament strengthened by the process of flashing. Here we find a combination which has not been improved upon to the present day. In the history of the world there has occasionally appeared a mas er patent, but there are comparatively rare, and always for some entirely new invention or discovery. We will now examine whether it is possible for such a patent to exist for motor traffic in the present state of things.

The only possible master patents which could exist would be of the following nature:

(1) The combination of a motor, other than steam, with a carriage suitable to run on highways.

(2) Combination by which gas in the cylinder of a gas engine can be ignited at any suitable time by means of an electric spark.

(3) The use of a carburetter when the gas is produced from an oil or spirit.

(4) The use of a silencer for the exhaust in the case of gas engines, when applied to a road carriage.

(5) The existence of a gearing which is only and solely suitable for light traffic.

(6) The use of a clutch in connection with light traffic.

This list is sufficient without dealing with other points whch have virtually no importance. In the majority of cases no distinction is drawn between the gas engine, oil engine, and benzene engine, since the word gas covers gas produced from any material suitable for the engine in question. But suppose a judge, who was not a technical man, was to hold a different view. Then his attention would be called to the existence of a list of patents dealing with engines which used gas produced from coal gas, oil and benzene, all of which have expired, so that no claim whatever could be made by any living man of rights connected with coal gas, oil, or benzene engines, of an exclusive character. Further, if a judge were to hold that a combination of an oil engine with a carriage was "useful, novel and ingenious," he would again be confronted with several old patents, which have expired, in which this combination was claimed. The same remarks apply to the whole list of various possible claims, which I have enumerated above. Patents have been taken out more than 14 years ago for oil motor tricycles and bicycles, for electric ignition, for ignition tubes, for clutches, and as for gearing we all know that there cannot be an exclusive right, as various forms have been used in connection with road traffic since the early part of the century. It may be inferred from these remarks that no patent taken out in connection with motor traffic is valid, but this I do not say. Some special device for doing a particular work may be a valid patent, but it will not be a master patent, and therefore will not prevent any one else doing the same work by a modified device. To show you more clearly what I mean, I will analyze a de Dion and Bouton tricycle. I will not say that there may not be some parts in the tricycle which are patentable, but if these were unheld it would not prevent anyone else making a motor tricycle, leaving out the patented portion The motor itself, as far as I can see, has nothing novel about it. Its success depends on good manufacture. If there was any point in this motor upon which a valid patent could exist a motor could be made just as good leaving this point out. The electric ignition has nothing particular about it to commend itself, although it is said that current is saved by the method adopted. It is an old laboratory device, namely, a tetanus spring set in motion by a rotating cam, which was "common knowledge" when the patent was granted; but from an electrician's point of view there are far better ways of achieving the same result, supposing it to be held that the ignition device is a good subject for a patent, and these are open to all.

To sum this up, an equally good tricycle can be made to do all which the one in question will do, without being subject to patents. The success of the tricycle in question is unquestionably due to excellence of manufacture, and not to any novel invention. I will not weary you by going through all the types of carriages, whether driven by steam, oil, compressed gas, compressed air, or electric energy, but I could prove with the greatest ease that the same remarks which I have made in regard to the tricycle hold equally good as regards other types, and consequently there is no such thing as a master patent for motor traffic, nor can any one claim a monopoly in this respect. At the present juncture a few words of advice to existing or intending manufacturers of motor carriages will no doubt be acceptable, when offered by one who stands in a completely independent position. When a manufacturer is threatened with an action for infringement, if he desires to continue to manufacture and place upon the market the article complained of, there are the proverbial three courses open to him:

(1) To knock under and make terms.

(2) To continue to take no notice and risk an action.

(3) To take steps to compel the patentees to start an action first, and oblige the threatening parties to prove their case.

I strongly advise the latter course to be followed in every instance, and the method of procedure which I would recommend is the following: When a manufacturer has the slightest doubt as to his position, he should make one of the articles stated to be an infringement and place it on the market, then give notice of the fact to the parties who claim the rights and demand a reply within seven days. The reply must definitely state the intention to commence an action for infringement, or some equivalent form of proceeding. If not, it is evident that the parties claiming do not intend to face the courts. If the answer takes the form of a threat, and no further action is

taken, then the manufacturer should start an action on his own account to compel the parties to go into court. It is a very simple matter to prove or disprove whether the device which has been made is an infringement or not. There is a general idea that an enormous expense attends these matters. This is quite unnecessary. There is no doubt a judge is very apt to look upon any mechanical device with a certain amount of awe, because he is not a technical man, and probably has admiration for what he thinks is ingenious. The manufacturer, therefore, should ask for a technical assessor to sit with the judge. A technical man is hardheaded and will probably see no particular virtue in a device which is commonplace and unworthy of a patent. The assessor has not to be paid for by the contending parties. If it is then decided that the device in question is not the same, nor a colorable imitation of the article claimed to have been infringed, or that the patent is not valid, then the manufacturer is free, and may continu to manufacture without risk. If, on the other hand, the de cision is in the contrary sense, it is open to the manufacturer to make terms, or, which might prove the better course, to use a device outside the patent which would be more modern. This could only be done if the patent upheld were not a master patent, and such cannot exist in connection with motor traffic. In fact, any manufacturer, with £100 at his command, can thus protect himself against any individual or company, who may have hundreds of thousands to threaten with. Quite recently a small company which was threatened by the Dunlop Company brought an action against them for undue interference and won their case. I trust that the above remarks, brief as they are, may assist in clearing away doubts and hesitation on the part of many intending manufacturers If the present clouds could be lifted, not only would the coming industry show signs of life, but even those who now seek to obtain all the profit, must benefit with the crowd. The Self-Propelled Traffic Association, of which I have the honor to be President, effected good work last year in helping to obtain for the general public an equitable act for light motor traffic, and now it is equally desirous to secure for every Englishman that which he so highly values—his freedom. This is a fitting occasion to pay a tribute to the memory of an able engineer and a leader of the motor-traffic movement. Monsieur Levassor expired suddenly last month, leaving a gap which may never be filled again with such intelligence. As a man he was upright and honest; as an engineer he was able and clear headed; as a manufacturer he was conscientious; and as a friend he was true.

SUMMARY.

I will now conclude by summing up in a few words what I have said in regard to motor traffic.

For motor cycles, benzine motors probably have the advantage.

In all other cases, steam promises to be the motive power when real work is called for, and where a return upon capital expenditure is required.

Electric energy, if the necessary adjuncts exist, has a great field open in towns, as a luxury, where the question of upkeep is not a vital item.

Finally, the best existing motor the world has yet seen, for its power, method of fueling, suspension springs, and traveling long distances before recharging, is one which is likely to remain with us for many a long year to come, whatever may be the future development of motor traffic. It is known and loved by all, young and old, under the name of the horse.

From Cleveland to New York by Motor Carriage.

Combining business with recreation, Alexander Winton, President of the Winton Motor-Carriage Company, left Cleveland, O., with a companion on a new single-seated motor-carriage on the morning of July 28, and after a leisurely journey (two days including Sunday being used for resting), he reached New York City, Saturday, Aug 7, passing through Rochester, Syracuse, Utica and Albany.

The object of the trip was to test the motor in a long journey over all kinds of roads, and from Mr. Winton's account no greater test could have been given the machine, as, to use his own words, "The roads were simply outrageous." Fully two weeks of rainy weather had preceded him on the journey, and in many places the mud and water was hub deep, and in some places the sand was equally as bad. Any one familiar with the Catskill Mountain regions can appreciate the grades it was necessary to ascend, the roads there being very steep and and rocky, yet through it all the motor went without a hitch.

Though on the road nine days the actual running time was 78 hours and 43 minutes, and he is certain that owing to the innumerable grades and hills and the circuitous routes in quest of better roads, he traveled fully 800 miles The best day's run was 150 miles, though the object of the trip was not to see how quickly it could be made. Considerable time was lost at Albany by taking the west side of the river, but he transferred by ferry at Coxsackie, and had better roads from there into New York. The machine consumed on an average six gallons of gasolene a day, which would be a little more than half a cent a mile for the trip. Much interest was shown by the people on the road and especially by those in the mountains who doubted his ability to climb the hills. The demonstration, however, is regarded as complete, and Mr. Winton is entirely satisfied with the working of the new motor.

New Gas Engine of Wonderful Economy.

From Munich, Germany, comes a report of a marvelous new gas engine invented by an engineer named Rudolph Diesel, and capable of turning into energy 28 to 30 per cent. of the heat generated by combustion. The air is compressed to 45 atmospheres, the gas is superheated and the petroleum injected into it.

In this manner an engine of unheard-of economy of fuel is said to be produced.

No less a person than Krupp, the great gun maker of Essen, is interested in the patents.

I am much pleased with your paper and find it very useful.

A. A. BARNHART.

MONTREAL, QUEBEC.

I take great pleasure in reading THE HORSELESS AGE and always get the latest developments from it.

W. F. BOWE.

MERIDEN, CONN.

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Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

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A SUCCESSFUL INVENTOR AND DESIGNER of Gas, Gasolene and Kerosene Motors, for stationary and road purposes, desires a situation in which he can have a moderate salary and an interest in his inventions. Address "OHIO," care THE HORSELESS AGE.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

A Splendid Opportunity.

Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE. which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection wi h a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

WANTED CAPITAL—To build and patent a new power Transmission for Motor Wagons. Will be gladly used by all motor wagon builders on royalty; will give 40 per cent. of patent. WESLEY KOUNS, Salina, Kans.

GASOLENE engines for motor carriages, cycles, launches, etc. Light, compact, powerful, reliable. Two actual horsepower, $135; three, $165; four, $225. Other sizes. Two old style 2 H. P. motors, $90 each; guaranteed good. A. D. STEALEY, 1353 26th Avenue, Oakland, Cal.

Designs and Estimates Wanted for the Following Horseless Vehicles:

One Enclosed Parcel Delivery Wagon. One Baggage and Express Wagon. One Pleasure Vehicle, seating from ten to twelve persons. Grades, 5, 7 and 12 per cent. The Roads for the Pleasure Vehicle will be the hardest for travel, being at times sandy, with ruts and holes, and short pitches of a 12 per cent. grade. These Vehicles must contain the best material and be guaranteed for not less than twelve months. All suggestions that will tend to make the best and most desirable Vehicles are asked for and will be received with thanks. Estimates for each Vehicle must be separate.

R. M. DALE, 861 Eighth St. San Diego, Cal.

G. H. EDWARDS, 519 Carroll Avenue, Chicago, patentee of the Trussed Tractor, illustrated in the March number, wishes correspondence with parties who take an interest or manufacture the same. It is the result of several years of experiment on the farm. It does the work at one-eighth the cost of horses.

FOR SALE.—Horseless Carriage, $600; cushion tires, gasolene motor. OWEN BROS., 472 E. Prospect Street, Cleveland, O.

WANTED.—To buy Horseless Carriage; send photo or cut of same; state motive power, speed of carriage and where it can be seen. Address "J. M.," Post-office Box 95, Hamilton, Ontario.

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The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

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AMERICAN MOTOR LEAGUE.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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The "Heavy Motor" Competition.

THE world has heard a great deal of the pleasure side of the motor vehicle but very little of the business side of the question, which is by far the most important of the two. The recent "heavy motor" contest in France must therefore be regarded as marking an era in the new industry, for it was the first of its kind, and was managed as successfully as all the past competitions in which the Automobile Club has had the directing hand. The number of competitors was sufficient, and the routes chosen difficult enough to give conclusive data as to the practicability of motor vehicles for the transportation of heavy loads of both passengers and merchandise over common roads. As might have been expected the steam vehicles showed their superiority over the petroleum in their greater reserve power for hill climbing and hauling loads exceeding one ton in weight. They ascended the hills at about the same speed they were permitted to take on the level. To counterbalance this is the extra attendance required for stoking and caring for the boiler, and the necessity of more frequent stops to replenish fuel and water. In consumption of fuel, though the advantage rests with the petroleum motors, the De Dion steam omnibus made a remarkable showing in this respect when its large horse power is borne in mind.

The light petroleum omnibus of the Panhard Co. was highly commended, its chief weakness as compared with steam being its inability to master the steep hills at a better pace than three miles an hour. In no instance, however, did it fail to reach the top unaided, and in cleanliness and economy of fuel and management it was certainly ahead of the steam omnibuses. Only one expert man was necessary for its management, while two men, an engineer and a driver, were kept busy in handling each steam vehicle. In very hilly districts the petroleum motor would be outclassed by the steam engine.

Several of the steam vehicles had too little reserve power to accomplish some of the steepest grades. In fact, it is demonstrated by this trial that a pressure of over 200 pounds must be available at all times to meet emergencies.

Altogether the trials were so satisfactory that a great impetus has been given to the demand for this class of vehicles in France, and the competition is to be repeated annually over the same course and under the same conditions.

The Speed Craze in France.

THE speed craze is on in France. Ever faster and faster are the motors running. In the Paris-Trou-

ville race, the remarkable average of 29 miles an hour was made by the winning vehicle, and even in their daily driving the "chauffeurs" are becoming more reckless in their pace. Fortunately accidents have thus far been few, but such immunity cannot be looked for long if the craze is further encouraged. The serious, if not fatal, accident that befell one of the contestants in the Paris-Trouville is a timely warning of the dangers attending the sport.

Sufficient proof of the speed and staying powers of the motor vehicle has already been furnished. Road races from this time on can only endanger life and set a bad example for the ordinary user of motor vehicles. If, as seems probable, races will still be demanded by the public, let them be held on race tracks, built for the purpose, where the only lives in jeopardy will be those of the contestants, who voluntarily assume the risk.

From Paris to St. Petersburg.

The Automobile Club is surpassing itself. Having brought France under the sway of the motor, it is looking about for new worlds to conquer. A herculean race is on the tapis for next year—no less a tour de force than a run from Paris to St. Petersburg, a distance of nearly 2,000 miles.

The route proposed is through Mauberge, Namur, Liege, Aix-la-Chapelle, Cologne, Hanover, Magdeburg, Berlin, Sonnenburg, Posen, Warsaw, and thence up to St. Petersburg. The detail connected with the preparation of such a race would be enormous. The consent of all the officials of the different countries and towns traversed would have to be obtained, and arrangements made for the safety of both racers and residents. Depots for supplies and refreshments would have to be provided at frequent intervals, as well as storage places for the vehicles at night. Owing to the bewildering variety of the road laws of the villages on the route, considerable delay and difficulty would be met in simply securing permits to pass through their confines. In Russia the roads are reported very bad, so that the time made could not compare favorably with that already recorded in the French races. But as a demonstration to the other European nations, of the universal powers of the motor carriage, the contest ought to be a success, and certainly will be, if the Automobile Club decide to hold it.

"Hear ye not the hum of mighty workings?
Listen awhile ye nations, and be dumb."

The Motocyclomania.

Prior to the Paris-Marseilles race the French hardly regarded the motor tricycle seriously. The three-wheeled machines, it will be remembered, acquitted themselves rather badly in the Paris-Bordeaux race of the previous year, and were consequently looked upon as mere toys. But the remarkable performance of the De Dion tricycles in the Paris-Marseilles race opened the eyes of the skeptics to the possibilities of these little machines, and now they are quite the rage among the cyclists and boulevardiers of Paris. The popular way of spending a vacation among the smart set is to take a tour on a motor tricycle through the provinces, or even across the border into Germany or Italy. The sensations of coasting or spinning along a smooth stretch, so mounted, are said to be quite unlike anything previously experienced in the line of locomotion. So great is the furore becoming that the factories are doubling capacity in the vain effort to keep up with the demand, and the press has humorously dubbed the new fad the motocyclomania.

Indications are not wanting in our news columns to show that this most fascinating malady, as it is termed by a French contemporary, has already seized its first victims on this side of the Atlantic. May it spread rapidly and become incurable!

The Other Side of the Case.

Said a leading metropolitan newspaper recently apropos of the burning of the central power house at Washington, D. C:

"The destruction of the power house which supplied the cable roads at Washington gives the horse a great opportunity to smile at those who were so certain that we are bearing down on the horseless age. If it were not for the horse the Washington people would be walking the streets to-day."

Promoters of the motor vehicle take quite a different view of the situation. They are thinking what an excellent opportunity it would be to introduce a line of motor stages in the capital city. The managers of the railroad are doubtless thinking the same thing, while they are compelled to go back temporarily to the old horse motor with all its inconvenience and expense.

The London Cab Fatality.

The other day one of the electric cabs in London caused the death of a schoolboy, who "tagged behind" the vehicle and was caught by the chain and

drawn into the gearing. When the cab was stopped the poor little fellow was dead. The coroner's jury returned a verdict of accidental death, but the question is pertinent whether the company was not in a degree culpable in using exposed gearing in crowded thoroughfares. As a protection from moisture and dust alone, and apart from the consideration of safety, a covering seems desirable.

The New Beeston Cycle Co., Limited, of Coventry, England, which was organized about a year ago to manufacture bicycles and De Dion motor tricycles, is undergoing reconstruction, namely, a separation of the bicycle and motor businesses and a reduction of the capital stock, which was nominally £1,000,000 and actually £574,000. Two companies are the result, one a cycle company, with a capital of £100,000, and the other a motor company, with a capital of £110,000.

The shareholders of the Great Horseless Carriage Co. are becoming dissatisfied with the present status of the company and are combining to better their prospects, if possible. The capital of the concern was £620,000 in £10 shares, which are now worth a few shillings only. It is claimed that the British Motor Syndicate and the Daimler Motor Company have the advantage of the Horseless Carriage Company in the arrangements established between them by the promoters.

Mexico furnishes her first motor vehicle in this issue of THE HORSELESS AGE, and a very pleasing one it is in general appearance. We congratulate our Southern neighbors on the progressiveness they show, and hope the time is not far distant when the boulevards and plazas of the imperial city will be enlivened by motor vehicles as they are now by cycles.

The very latest monstrosity of the word coiners is "motocycle-delivery wagon." Could anything be worse than this? One would think that having now reached the very reductio ad absurdum of clumsy expression, the inventors of language would see the error of their ways and adopt the common sense motor terminology now generally used in this country.

That Chicago Electric Cab Company.

It has been reported that an electric cab company was in course of formation at Chicago, Ill., and that Samuel Insull, of the Chicago Edison Co., was its president..

In reply to a letter of inquiry Mr. Insull denies all knowledge of any such company.

The Overman Motor Carriage.

When an idea has thoroughly taken possession of the human mind and a want is keenly felt there is always genius forthcoming to satisfy this universal want.

No one now doubts that the horseless carriage is both a necessity and a certainty, but that there are various approaches to the idea has already been demonstrated in the many crude efforts to put upon the market in one form or another a four-wheeled vehicle propelled by steam, oil or electricity.

The first form which an invention of this kind takes is not always—in fact, not usually—the one with the most permanent qualities.

While others have been heralding abroad their discoveries, in the field of motor carriage building, A. H. Overman of bicycle fame, with his corps ot expert mechanics and skilled inventors, has been quietly working brain and hand, observing, experimenting, recording, testing, etc., with the result that a motor carriage is now added to the long list of mechanical triumphs brought out by the Overman Wheel Company, Chicopee Falls, Mass.

The Overman Motor Carriage is new, original, and quite unlike any other yet produced. The company claims it has solved completely the difficult problems involved in the use of hydro-carbon oils, ponderous machinery, complicated mechanism, great cost of production, and great expense of operating.

Medium weight, medium cost, high speed, and economic use of power have all been attained in the Overman carriage.

This carriage is propelled by a hydro-carbon engine, generating four horse-power without odor, and at a cost of less than one-half cent per mile. It is geared to a speed of thirty miles per hour.

The Sintz Motor Carriage.

Among the entries for the Chicago race, November, 1895, was the Sintz Gas Engine Co., Grand Rapids, Mich., who, however, failed to finish their carriage in time to compete. They have been at work upon the problem ever since and have recently completed a carriage which they say surpasses their most sanguine expectations. Manager Winter writes:

"We have yet a hill to find that we cannot climb or a street so crowded that we cannot traverse it."

Full particulars of this vehicle will be given in our next issue.

Motor Lawn Mowers.

The Coldwell Lawn Mower Co., Newburgh, N. Y., who are the largest manufacturers of horse lawn mowers in the country, have fitted a four horse power Riotte gasolene motor to one of their machines with most satisfactory results. The machine cuts a 40 inch swath and mounts inclines with ease. The Coldwell Co. will make a few necessary changes in their mowers and then put on the market a line of motor lawn mowers, which will cut grass much faster than a horse, and without injury to the lawn.

FIRST MEXICAN MOTOR CARRIAGE. MOHLER & DEGRESS, MEXICO CITY.

First Motor Carriage Built in Mexico.

Mohler & DeGress, Mexico City, Mexico, dealers in bicycles and machinery, have been astonishing the denizens of that municipality by scudding through the streets lately in a very handsome motor buggy of their own manufacture.

The motor, which is placed in a framework above the rear axle, is of the gasolene order and develops three H. P., driving the vehicle at a speed of 20 miles an hour on a level road.

Power is transmitted by a friction disk to a shaft having a small pinion at its end. This pinion engages with a large pinion fixed to the rear axle.

To set the vehicle in motion a lever in the bottom of the carriage is pressed, and a foot brake is also used in emergencies.

Speed and steering are controlled by the one lever.

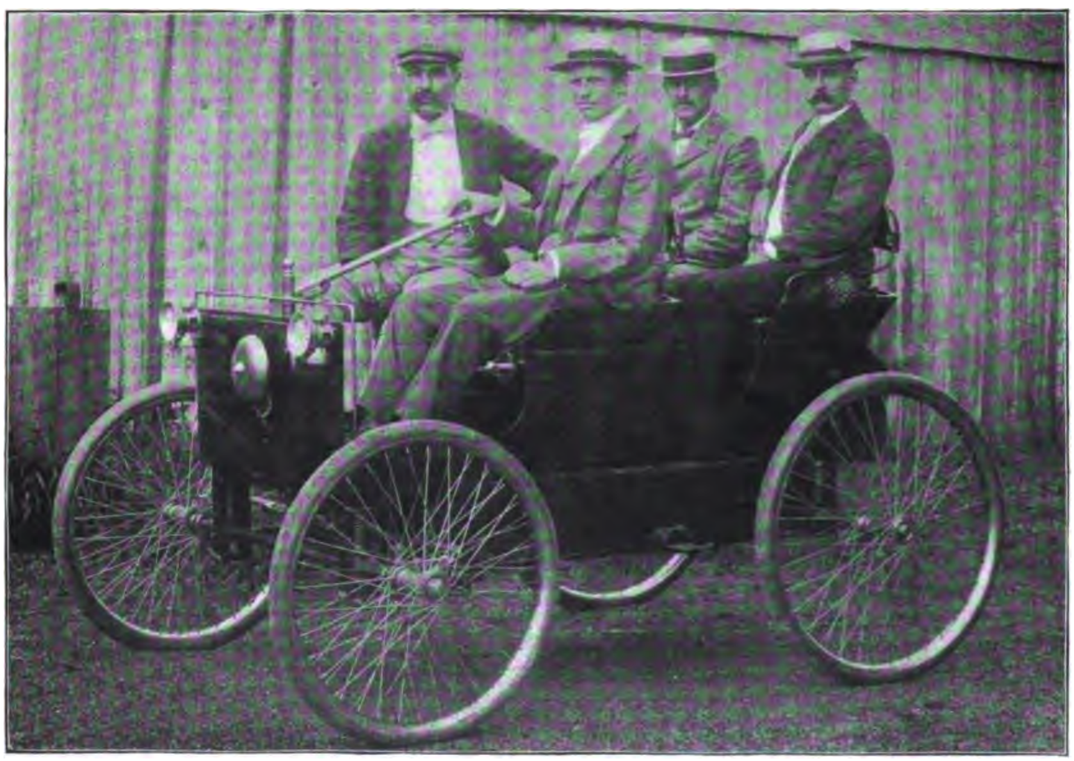
Mohler & DeGress are said to have been the first firm to manufacture a bicycle in Mexico, and in thus anticipating the demand for motor carriages they are but true to their record.

They have taken out patents on the principal features involved and expect to manufacture the vehicle somewhere in the United States.

Several French motor carriages had previously been seen in the Mexican capital.

Several Eastern fair managers are giving their patrons a glimpse at the motor vehicle this fall. Such an attraction has proved a drawing card wherever advertised and has very perceptibly increased the gate receipts. Several Duryea wagons have appeared in these events, in some cases being the only entries. The Duryea Motor Wagon Co. wish to say that these wagons are entered by private parties and that they have no racing wagons in use at present. All wagons heretofore sent out are geared for actual road service and while they are much faster than the legal limits in most places, they are not racers by any means. It is not difficult to drive a properly built wagon a mile in two minutes, but buyers have not found use for such speeds in actual road service, which is the final criterion.

THE BARROWS THREE-WHEELER. (SEE PAGE 15).



CARBONIC ACID MOTOR CARRIAGE. W. L. HOWARD, TRENTON, N. J.

FOREIGN NOTES.

De Dion & Bouton are about to put on the market a motor bicycle.

The Daimler Motor Co. claim their carriages may now be run a distance of 50 or 60 miles without replenishing the cooling water.

Minnie Palmer, the popular American actress, now playing in England, has purchased a Daimler motor carriage, in which she will travel through the country.

Mr. Barsaleaux will use common bearings and ordinary tires, as he calculates that it is cheaper for a poor man to use a little extra oil every day than to indulge luxuries.

Several motor livery companies have lately been organized in Paris. The vehicles are sent out in charge of skilled motormen when customers are incompetent to handle them.

Frederick R. Simms and other motor enthusiasts of London have decided to organize the Automobile Club of Great Britain, to succeed the Motor Car Club as an exponent and defender of the new industry.

The Irish Cycle and Motor Co., of Dublin, Ireland, which was organizing to manufacture motor vehicles under the Pennington patents, has been wound up and the money returned to the subscribers, less pro rata expenses so far incurred.

Ernest M. Bowden, 9 Fopstone Road, Earl's Court, London, S W., has invented a new mechanical movement for transmitting power along slack wires without the use of pulleys, angle levers or ball joints. He believes it will be found available in motor vehicles for operating brakes and making other connections.

The Paris Omnibus Co. see no way of providing for the crush of business which is sure to attend the International Exhibition of 1900 but by the substitution of mechanical for horse power. As a result of the recent heavy vehicle trials they have ordered a number of steam omnibuses, which will be put in service at once.

The French bicycle manufacturers have decided not to hold a cycle show the coming winter. The way is left open for the motor vehicle manufacturers to organize an exhibition of their own, which they will no doubt do. Baron Zuylen de Nyevelt, President of the Automobile Club, is now trying to get the concensus of opinion of the manufacturers on this point.

L'Electrique (Societe Anonyme), Brussels, Belgium, has recently turned out a two-seated electric carriage of very neat appearance. The battery, which is placed under the seats, consists of 48 cells, the plates being of the Plante type. The total weight of the battery is 950 pounds, and it is charged by a current of 25 amperes at 110 volts, the time occupied being about three and one-half hours. The capacity is about 86 ampere hours at a discharge of 18 amperes. The current actuates a series-wound motor, which runs at 1,750 revs. and weighs 275 pounds. At each end of the armature spindle is a pinion which, by means of a chain, transmits motion to the rear wheels. The ordinary differential gearing is being interposed. The total weight of the carriage is 2,420 pounds, and it is claimed that it can be driven, at the rate of 10 miles, a distance of between 40 and 50 miles without recharging.

MINOR MENTION.

The Pope Mfg. Company are making steel rims for motor carriage wheels up to 3 inches diameter.

J. R. Tinkham, President of the Tinkham Cycle Co., West Fifty-ninth Street, New York, is in Europe looking up motor interests.

It is reported that a company is being organized at Dayton, O., to manufacture electric vehicles under patents owned by Chicago parties.

John Wanamaker, the dry goods merchant of Philadelphia and New York, is offering for sale motor tricycles of the De Dion & Bouton make at $600 apiece.

The Haynes & Apperson Co., Kokomo, Ind., are reorganizing with increased capital. Their latest machine is a two-passenger vehicle designed for high speeds.

The Olds Motor Vehicle Co., capital stock $50,000, has been organized at Lansing, Mich., to manufacture the Olds motor carriages, previously described in our columns.

Robert Aldrich, a well-known mechanic of Worcester, Mass., is constructing a motor carriage which weighs complete about 475 pounds. He has orders for several of them.

The pneumatic hub as a substitute for the pneumatic tire is now being brought to the fore. It is said that Gen. Miles has ordered ten bicycles with hubs of this kind built for military use.

W. W. Stall, president of the Boston Wood Rim Co., Bedford, Mass., returned from Europe recently, bringing with him a Bollee tricycle, which has since been seen frequently about his summer residence near Holyoke, Mass.

J. Friedenstein, manager of the American Cycle Fittings Co., 320 Broadway, New York, has imported a Clement-De Dion tricycle, and announces that he will appoint an agency here for the sale and ultimate manufacture of them.

Dr. R. V. Pierce of Buffalo, N. Y., son of the founder of the "Golden Medical Discovery," has purchased an electric carriage of the Pope Company. Messrs. Maxim and Parker of the motor carriage department accompanied the vehicle to its destination in order to initiate the purchaser.

A. D. Stealey, 1353 Twenty-sixth Avenue, Oakland, Cal., is shortening the overall length of his motors and putting all the valve rigging on one side, reducing the length about six inches. His new style 4 brake, horse-power, single cylinder vehicle motor measures 30 inches long, 13 wide and weighs about 200 pounds.

J. B. West, Rochester, N. Y., of tire-setter fame, has abou perfected the motor carriage illustrated in the first issue of THE HORSELESS AGE, and will soon commence the manufacture of "vapor" motors for road vehicles of all kinds. The new carriage weighs 1,500 pounds, and is to be seen almost daily in the streets of Rochester.

Elmer E. Vance, the well-known playwright and manager, is now exhibiting through the Middle States a play called "Patent Applied For," in which a motor vehicle is introduced on the stage and in the streets of the cities visited. The vehicle is a Bollee tricycle of the usual pattern, Mr. Vance having made only slight changes to adapt it to his purpose. One requirement was that it should turn in an 18 foot circle.

The Balzer Motor Carriage.

One of the neatest motor vehicles yet produced has just been completed by Stephen M. Balzer, 370 Gerard Avenue, New York City.

The vehicle is of the bicycle pattern and has a seating capacity of four dos-a-dos, if the rear seat is lowered and a cushion added. When not in use this rear seat can be folded up to form an artistic back.

The front wheels are 24 inches in diameter and the hind wheels 30 inches. The gauge of the front is 26 inches; of the rear 32. Tangent wire spokes, heavy wood rims and 2½-inch Palmer pneumatics are employed. The hubs are 4 inches in length and the axles 1 inch in diameter.

The weight of the entire carriage is 345 pounds, but as 125 pounds of oak has been used in the body, Mr. Balzer thinks he can reduce this weight considerably by the substitution of basswood.

The motor is a 4-hp three-cylinder gasolene engine of the Otto type, running at 400 turns. Owing to the number of cylinders the inventor claims to get 300 explosions in 200 turns, leaving only one-sixth of a turn dead. One cam operates all the cylinders, which revolve with the fly wheel, reducing the necessary weight of the latter to 30 pounds. There is but one crank pin for the three cylinders, and the wear can readily be taken up by two jam screws from each side.

The weight of the motor including the fly wheel and main shaft gearing is 100 pounds.

The motor shaft is 1½ inches. The inventor claims that the motor is virtually noiseless in its operation, and that the rotation of the cylinders almost entirely subdues vibration.

Four oil cups are provided, one for the bearings and one for each cylinder. When in use the machine should be oiled once a day. Owing to the rotation of the cylinders the oil is forced up into the very end of the cylinder, a part which is difficult of lubrication in many gasolene engines.

In winter no water jackets are required, but in summer it is found desirable to use them, the amount of water needed being two gallons. The cylinders are of gun metal, 3x4 inches, and the cylinder heads and water jackets are cast in one piece, the cylinders being screwed into place.

The gasolene tank in front holds enough liquid for 20 hours.

Ignition is electric, a light dry battery made by Vitalis Himmer, a New York electrician, furnishing the current. Speed is regulated by phosphor bronze gears on the motoshaft, giving 3, 6 and 12 miles an hour. Other gears can be added if needed

On the hind axle is the ordinary differential gear. The gears are always in mesh, and when the speed lever is pressed forward a little the 3 mile speed engages, a little more pressure throws in the 6 mile speed, still more the 12 mile, while pressure beyond this applies the brake.

Steering is accomplished through pivoted wheels, the lever being attached at either the right or left hand side of the dash, as desired. Convenient to the steering hand is a bicycle alarm bell.

The motor is started by a crank at the end of the shaft.

All the joints in the frame are flush and are made with cap nuts, securing a perfectly smooth surface. Below the edge of the seat is a switch which stops the motor.

This is the third three-cylinder carriage motor which Mr. Balzer has built, and with this he is well satisfied. He has run the vehicle about over the none too good roads of the annexed district, and states that he has climbed grades of one in six.

It is the inventor's intention to organize a company to put his vehicle on the market.

It will be sold at a moderate price and 100 machines will be ready for delivery in May.

Electric Delivery Wagons in Chicago.

The American Electric Vehicle Co., of Chicago, Ill., have recently built two electric delivery wagons for the firm of Charles A. Stevens & Bros., a silk house of the same city.

C. E. Corrigan, the manager of the company, states that the batteries are 75 per cent. lighter than any other in use, yet have a greater mileage capacity, and that as they occupy but little space, they can be so placed as not to injure the appearance of even a pleasure vehicle.

The electrical equipment consists of 44 Crowdus storage batteries, of the heterogeneous type, of 100 ampere hours' capacity each, and weighing 13 pounds each. This is claimed to be from 60 to 75 per cent. less weight, for the same output, than any other storage battery.

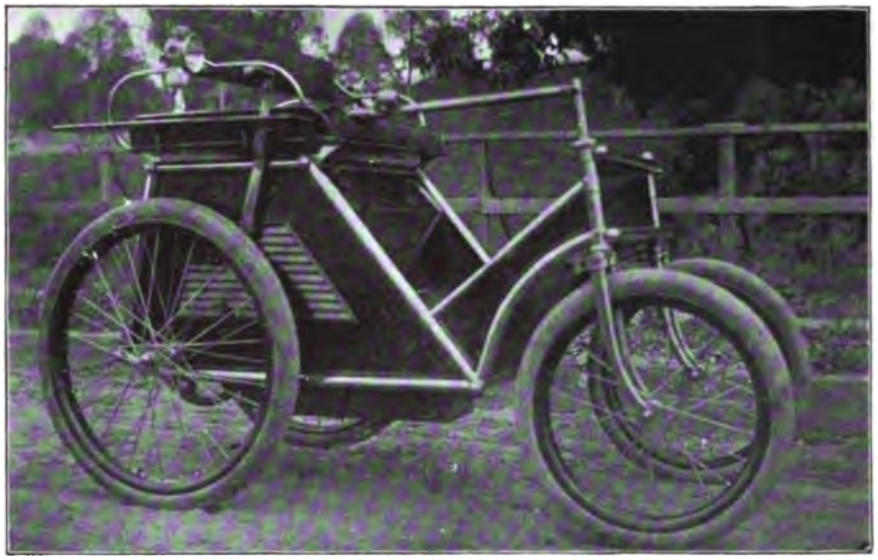
These batteries are also a radical departure from old forms n that they are the first to have a practically flexible, lead, supporting grid. They connect with a three and one-half horse-power motor of the company's design and manufacture, an iron clad and water-proof structure, of the four-pole pattern.

The charging of the batteries is said to be a very simple matter, easily managed by any purchaser possessing no technical knowledge. The apparatus consists of an automatic stationary rheostat which is equipped with meters indicating the proper volume of current and the number of amperes stored in the vehicle batteries. These have an apparatus which automatically disconnects them from the charging circuit, when fully charged. The plugs of the connections, and the binding posts of the batteries, and the rheostat are correspondingly marked, positive (t) and negative (—), so that the veriest tyro cannot err in placing them. With a turn of a small lever at his left hand he easily guides it exactly where he wishes it to go. A smaller lever at the seat reverses the course of the cariage, and, when removed, virtually ties up the vehicle.

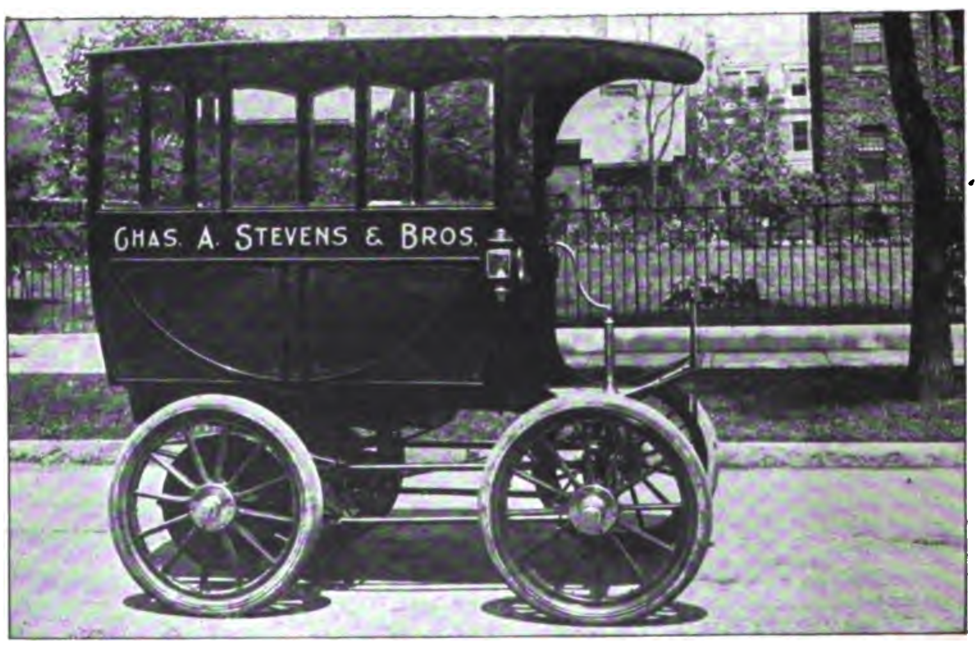
The wheels bear on frictionless ball-bearing axles and have three-inch pneumatic tires. One of the wheels carries an odometer, and, according to Mr. Corrigan's statement, this has proved that as great a distance as 64 miles has, under favorable circumstances, been run with one charging of the batteries.

The batteries afford exceptional opportunities for furnishing beautiful, illuminated wagon signs, an attraction which expert advertisers will quickly appreciate.

Stevens & Bros. are said to have ordered four more wagons of the same style.



GASOLENE MOTOR CARRIAGE. STEPHEN M. BALZER, NEW YORK.



ELECTRIC DELIVERY WAGON. AMERICAN ELECTRIC VEHICLE CO., CHICAGO ILL.

Joseph Barsaleaux's Motor Horse.

After three years of constant experiment Joseph Barsaleaux, a blacksmith of Sandy Hill, N. Y., has invented a motor horse that is quite a curiosity. The horse does not move on legs, but on a single wheel about two feet in diameter. This wheel is attached to shafts, just as the live horse is. Over the mechanism constructed on an oblong support covering the top of the wheel is the frame of a horse. The reins are attached to the mouth of the horse, and when pulled cause the animal to turn in whatever direction the driver may desire.

Mr. Barsaleaux has attached his invention to a two-wheeled roadcart, with the thills attached to the sides of the horse, and has operated it with complete success. The single front wheel is 27 inches in diameter and has a tire 4 inches wide. On this wheel is mounted an American gasolene motor. There are three sprocket chains employed, two running horizontally, while the third operates perpendicularly, running over a 13-inch sprocket attached to the front wheel and a 4-inch sprocket fastened to a shaft directly over it.

Six gear wheels operated by one shaft regulate the speed of the machine. At present Mr. Barsaleaux can run his machine two, four or six miles an hour, as he may desire, and expects to run the vehicle backward without reversing the engine.

At present the machine weighs 550 pounds. Eventually the weight will be reduced to about 350 pounds. The dummy horse that will cover the machinery on the front wheel will resemble the horses displayed in carriage factory warerooms.

The motor employed by Mr. Barsaleaux in his experiments is a No. 1 American motor, which gives him speeds of 2, 4 and 6 miles an hour on a country road. He will substitute a larger motor of the same make.

To Make the Duryea Wagons in Canada.

Preparations are on foot to make the Duryea motor wagon in Canada, and application has been made for a charter for a company to be known as the Duryea Motor Co., of Toronto. The nominal capital is $250,000, and the provisional directors are: S. F. McKinnon, George W. Yarker, Samuel Rogers, Timothy Eaton, and H. E. Ficken, all but the last named residents of Toronto. The company have approached the town of Thorold as to a bonus for locating the factory there. The conditions are that $25,000 of the capital shall be paid in before the by-law is submitted, and $70,000 within 270 days thereafter. The town is asked to give a cash bonus of $20,000, for which it will take a lien on the property to that amount. The works are to remain in the town for twenty years, but nothing is said as to the number of hands that will be employed. The Mayor is authorized to call a meeting to take action, but meanwhile, some of those interested in the company are in favor of locating in Toronto, if the city will allow exemptions.

The Altham Motor Carriages.

The Altham International Motor Co., Boston, Mass., recently made a test of their new motor carriage at Fall River, Mass., where the inventor, George J. Altham, resides.

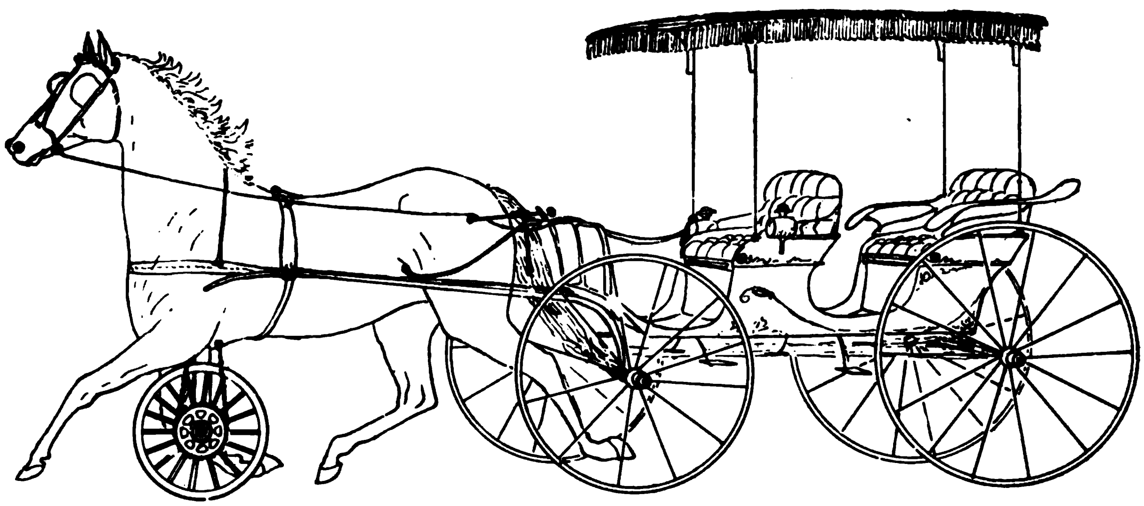
The new vehicle, which is purely experimental, weighs about 1,200 pounds and is propelled by a six horse-power horizontal kerosene motor, having two balanced cylinders.

Carbureters are employed, which can be heated to the necessary temperature for firing the charge in about five minutes.

Power is transmitted by gears, but this part of the mechanism is not yet perfected to the inventor's satisfaction.

The front wheels are pivoted at the hubs and all the movements of the vehicle are controlled by one horizontal lever in the ordinary way.

The C. H. Black Manfacturing Co., carriage builders, of Indianapolis, Ind., are exhibiting a motor-carriage of their manufacture, which is quite pleasing They are organizing a company to build these and also delivery wagons for light uses.



MOTOR HORSE. JOSEPH BARSALEAUX, SANDY HILL, N. Y.

Electric Broughams for Winter Use.

The Electric Vehicle Co., who are now operating the electric hansoms in New York City, have constructed a number of broughams for winter use. The bodies are similar in size, width and construction to those of the regular broughams. The only exception is the size and style of boot, which being made to suit the space required for the storage batteries, is longer and wider, and of entirely different shape from an ordinary brougham. The wheels are the same as those of the hansoms. The shape and position of the springs differ from those on the hansoms. The tires are over one-half inch thick and three inches in diameter, and very hard, but, when in contact with the road, flatten considerably from the weight. The painting and trimming are similar in both vehicles. The colors are the same, and both are trimmed with green cloth.

Motor Carriages at Fairs.

Wm. M. Ashley & Son, Springfield, Mass., who make a business of exhibiting motor carriages at agricultural fairs, have had a busy September this year, having filled the following dates: Massachusetts State Grange fair, Worcester, Mass., three carriages, September 1 and 2; Rhode Island State fair, Providence, R. I., three carriages, five days; Berkshire Agricultural Society, Pittsfield, Mass., two carriages, September 14, 15, 16; Grange fair, Danielson, Conn., one carriage, September 15 and 16. They are not governed by racing rules, but are showing as a special attraction, giving, where two or more carriages are shown, an exhibition race of five miles on the track.

Heavy Motor Vehicle Trials in France.

The most important event of the month of August in Europe was the competition for heavy vehicles, held at Versailles, near Paris, from August 5 to 11. As all the trials previously held had been organized with a view to speed merely the Automobile Club very naturally thought the time had come for a trial in which speed should cut no figure whatever, but the practical points of general serviceability and economy alone should be considered, and vehicles of the heavier type, adapted to delivery or public passenger service, alone be admitted.

In order to make the test as thorough as possible the trials were extended over several days and roads were selected offering every variety of incline and impediment that might be met with in practice. Count Chasseloup Laubat, to whom the choice of routes had been referred, settled upon three leading out of Versailles. Each vehicle was obliged to cover these routes twice and thus establish a fair average performance.

Representatives of the Automobile Club called "commissaires" accompanied the vehicles to see that the provisions of the trial were complied with and to take notes of all matters of scientific interest.

When the hour for the competition arrived ten vehicles had put in an appearance: A De Dietrich truck, carrying three passengers and about 2,800 pounds of iron; a Scotte steam tractor, hauling a wagon loaded with over 9,000 pounds of merchandise; a Weidknecht omnibus, carrying thirteen passengers and 2,200 pounds of iron; a wagonette entered by the Maison Parisienne, carrying six persons and 900 pounds of merchandise; a De Dion & Bouton tractor, hauling a wagon containing 33 passengers and 300 pounds of baggage; an omnibus of the same firm, seating 16 persons besides the driver and stoker; a Scotte omnibus, carrying six persons, two drivers and 1,500 pounds of dead weight; a tractor of the same make, carrying 13 passengers and 650 pounds of baggage in the forward or drawing vehicle, 8 persons and 2,000 pounds in the rear wagon; a Panhard omnibus seating 10 passengers, a motorman and over three tons of dead weight.

The first route was 25.6 miles in length, of which seven miles was paved. The second was 28.5 miles long (3.5 miles paved), and the third 41 miles, 6.6 miles being paved. Some of the grades encountered on these routes were nearly 15 per cent. No prizes were offered and no racing was allowed.

The commissaires were required to give particular attention to the following points:

GENERAL OBSERVATIONS.

Completeness of combustion and smell of exhaust.

Noise of exhaust.

Visibility of exhaust (particularly in the case of steam).

Vibration.

Ease of suspension.

Noise made by the vehicle while running.

Dust or dirt arising from fuel, lubricants, etc.

Construction of the motor and freedom from parts liable to get out of order.

Facility of steering.

Change of speed, whether easily accomplished or not.

Inability to start on inclines.

Necessity or otherwise of going backward in order to obain momentum for overcoming an obstacle.

Necessity or otherwise of lightening the vehicle when starting.

Weakness of brakes (stopping-place passed in going down hill).

Necessity to supplement the brakes by "scotching" the wheels, etc., when stopped going uphill.

Failure of brakes or faulty release.

Defective lubrication (necessity to stop to oil engine, axles, or any part).

Capacity of bunkers and feed-tanks (fuel or water expended en route).

Loosening of any part.

Heating of any part.

Breakage of any part.

Damage to tires.

STEAM-PROPELLED VEHICLES.

Leakage of steam, or water in any part.

Action of feed-pump.

Insufficient evaporative power (necessity to wait for the pressure to rise before being able to start or to mount hills).

Formation of "clinkers" (necessity to break up the fire often or to draw out cinders, etc.).

OIL-PROPELLED VEHICLES.

Efficiency of ingition.

Regularity of explosions and feed.

Degrees of smoothness with which gears are changed.

Circulation of cooling-water.

Leakage of oil tanks or pipes.

On page 12 is given a tabular statement of the performances of the various vehicles during the trials.

The vehicles were dispatched at intervals of 15 minutes, the first to start being the Scotte omnibus and tractors, which made a very satisfactory run, showing that they were easily managed on grades, and could maintain fair average speed on the steepest hills. In fact the hills were surmounted at nearly the same speed as was taken on the level stretches. Stops ot two or three minutes were made to take in coke and water and allow the passengers to seek refreshment. The speed varied from 7 to 10 miles an hour, the steam pressure running from 90 to 180 pounds. It was found necessary, occasionally, on the steepest descents to open the gravel pipes in front of the driving wheels to prevent slipping. The drive chains had to be tightened in several instances, involving a loss of considerable time, and in one case only the engine got out of order.

The Scotte wagons are propelled by two cylinder vertical engines of compact design, making 40 revolutions. The noise of the exhaust is said to be scarcely noticeable nor is it visible ordinarily.

The Scotte wagons are now in operation for public service in the neighborhood of Paris and in other parts of France, with very excellent results, so that the company who manufacture them—the Societe des Chandieres et Voitures a Vapeur—have many ordeis on hand.

M. Weidknecht, 10 Boulevard Macdonald, Paris, had fitted a steam tractor to one of the regular omnibuses of the Paiis company, believing that the present rolling stock would have to be utilized if the companies were to adopt any system of mechanical propulsion. In his design all the machinery is placed on the forward wheels of the tractor, which do the driving. The multitubular boiler comes close to the ground, and the engine has three horizontal cylinders. This arrangement of making the forecarriage separate, it was believed, would suppress vibration and jolting, but this did not prove to be true. The lateral motion was very disagreeable and even dangerous to those riding on top. The rear wheels being used for steering the bottom of the vehicle was consideralby narrowed at that point and the springs brought closer together, causing a lack of stability. On leaving Versailles a steep hill was encountered which could not be surmounted with the steam pressure then shown. Other delays due to the same cause followed, the chimney being defective and affording insufficient draught. Stoppages for water weie also more frequent on this account. The steam pressure was continually falling on the ascents, and the vehicle had to come to a standstill to allow the pressure to rise again. Through an unfortunate accident this omnibus was withdrawn from the competition at the end of the first trip. In backing the vehicle up to a pump to take water the fireman forgot to apply the screw brake and a collision with a house resulted which so weakened the under frame that it was deemed unsafe to attempt to complete the programme.

Of all the vehicles entered the De Dion steam omnibus seemed to be most favorably regarded. The De Dion system has already been described in THE HORSELESS AGE, and it is only necessary to add that the engines here employed developed 30 horse power in the brake. A high steam pressure was maintained throughout the course and the hills were taken at a very smart pace, averaging 10 miles an hour. The consumption ot coke and water was remarkably economical for the work done. M. Bouton himself conducted the vehicle.

The Panhard omnibus compared very well in appearance and performance with its steam rivals. It was propelled by a four-clyinder Daimler motor, of 12 horse power. The vibration, when at a standstill, was scarcely appreciable to the passengers. Unlike the steam vehicles, however, the petroleum bus was compelled to use a slow speed in ascending the hills, though in no case did it fail to reach the summit. The stoppages were less frequent than in the case of the steam vehicles and the amount of water and fuel consumed much less. The passengers were all much pleased with their experience, having no fault whatever to find with the petroleum omnibus.

The only truck shown was entered by De Dietrich & Co., of Limeville. It was propelled by a six-horse power petroleum motor, built by Amedee Bollee, of Lemans, and was capable of carrying about 2,500 pounds of merchandise. The motor is of the horizontal, two-cylinder type and is placed low down in front. Power is transmitted to a counter-shaft in the rear by means of belting, which runs at a uniform speed. This counter-shaft carries the speed mechanism, giving four speeds, the maximum being 10 miles an hour. All the working parts are enclosed, and require oiling every two hours. Considerable noise was made by the exhaust and the gearing, but in point of economy of fuel and ease of management the performance of the truck was very encouraging. The hills had to be taken at a very slow speed, scarcely as fast as a walk, the average speed for the entire course scarcely exceeding four miles an hour.

The steam brake, entered by Maurice Le Blant, was built in 1892 and won a prize in the motor competition of 1894. Its weight is about 7,500 pounds and it accommodates 12 passengers and 1,100 pounds of luggage. The machinery is placed in the rear. The boiler is ot M. Le Blant's invention, and the three-cylinder engines, running at 250 revolutions, develops 12 horse power. Accidents and break downs marked the course of this vehicle and it was withdrawn from the contest. The roof caught fire several times from the chimney, and the engine got out of repair so badly that the vehicle returned to Versailles without completing the first route.

The Benz wagonette, entered by the Maison Parisienne, shared a similar fate. It was made in Germany, and was driven by a two-cylinder, horizontal motor ot nine horse

power. It was supposed to carry 10 passengers and 900 pounds of baggage, but this load proved too much for it in the first steep hill, and it was found necessary to throw out all the dead weight, entirely disqualifying the vehicle. An arrangement was made with the officials by which the vehicle was allowed to complete the programme, but even when relieved of all dead weight the hills proved too much, and the passengers had to alight, and in some cases assist the recalcitrant motor. The real horse power developed was said to be only

Entry No.	Makers.	Total Time Occupied. Course A. (25.6 miles.)	Course B. (28.5 miles.)	Course C. (41.0 miles.)	Average Speed.	Remarks.
Run		H. M.	H. M.	H. M.	Miles per hr.	
1 1st	Scotte Omnibus	5 52	4 40	6 55	5.3	Carried 25 cwt. net.
1 2nd		5 38	6 0	7 35		
2 1st	Scotte Tractor	7 55	7 10	12 15	3.5	
2 2nd		7 56	8 12	?		
3 1st	Scotte Train	5 31	?	7 15	5.0	Carried 53 cwt. net.
3 2nd		5 29	5 41	8 18		
4 1st	Weidknecht Omnibus.	7 45	*8 0	?	—	*Chimney broke ran into a wall and damaged frame. Withdrawn from comp.
6 1st	Le Blant Break	—	—	*18 30	—	*Broke down and withdrawn. Too noisy. Engine seized twice.
8 1st	De Dietrich Truck	4 15	6 32	10 0	4.8	Carried 24 cwt. net.
8 2nd		4 20	5 1	9 32		
10 1st	Panhard Omnibus	4 0	*6 33	7 33	5 0	*1 hr. 27 m. delay through engine seizing. Carried 22 cwt. net.
10 2nd		5 0	5 42	8 50		
13 1st	De Dion & Bouton Tractor.	4 45	5 30	6 44	4.8	*Piston rod broke.
13 2nd		5 17	5 35	*11 0		
14 1st	De Dion & Bouton Omnibus	3 22	5 10	4 47	7 1	*Stood by No. 13.
14 2nd		3 0	3 25	*7 8		
15 1st	Maison Parisienne Wagonette	3 42	*7 40	4 50	5.6	*Underpowered 16 cwt. ballast thrown out and rest of trials made without any.
15 2nd		Broke down.	5 22	7 42		

six instead of nine, which was wholly insufficient to master so heavy a vehicle. The pump also gave trouble the first day.

SCOTTE OMNIBUS.

The Scotte omnibuses and trains are in successful operation in the neighborhood of Paris and in other parts of France, and the manufacturers have many orders ahead. De Dion & Bouton are also rapidly increasing their facilities for the production of their omnibuses and tractors.

The heavy motor competition was so successful that it has been decided to run them annually hereafter over the same routes and under the same conditions.

Representatives of the War Departments of both France and Germany, likewise committees from the Self-Propelled Traffic Association of England and the Belgian and Italian Automobile Clubs, were present.

Paris-Dieppe Race.

Le Figaro and *Les Sports*, two leading newspapers of Paris that have long been interested in the promotion of the motor vehicle movement in France, organized a race from St. Germain's to Dieppe, a distance of 106 miles, to be run on July 24.

Class A included motocycles or vehicles weighing less than 440 pounds, without operator or supplies.

Class B comprised motor carriages for two persons occupying one seat.

Class C, motor carriages carrying more than two persons, two of whom are seated side by side.

Class D, carriages carrying not less than six persons.

Vehicles of the first class paid an entrance fee of 20 francs, while those of the other classes paid 50 francs.

Sixteen prizes were offered, ranging from portions of the entrance money to silver and gold medals and objects of art presented by the Automobile Club, the managers of the contest and even by the President of the French Republic.

There were 69 entries, all but one of the gasolene type. The contestants were mainly amateurs, though a few manufacturers conducted their own vehicles, among them being G. Richard, Amedee Bollee, Tenting, Fisson and Lefebvre. In addition to these the following well-known makers were well represented: the Panhard Co., De Dion & Bouton, Bollee, Delahaye, Maison Parisienne, Landry & Beyroux, the Peugeot Co., and M. Mors.

At 9 o'clock the vehicles were sent off at intervals of 30 seconds, cheered on the way by enthusiastic crowds. Very few accidents marred the occasion in spite of the terrific speed attained, which was much greater than the officials of the Automobile Club had anticipated, as the special train they

WEIDKNECHT OMNIBUS.

De Dietrich Truck.

Le Blant Break.

Scotte Tractor.

Benz Wagonette.

Panhard Omnibus.

De Dion & Bouton Omnibus.

CONTESTANTS IN THE HEAVY MOTOR TRIALS.—(*From the Autocar.*)

had chartered for themselves and their guests arrived at Dieppe a half hour behind the Bollee machine that was first to reach the destination. It is only fair to say that the engine pressed into service for the special was of antediluvian construction and unable to compete with the more modern motor carriages.

A Bollee tandem completed the course in 4 hours, 13 minutes, 33 seconds, followed a few minutes afterward by the De Dion steam brake. A Panhard carriage came in next in 4 hours, 36 minutes. Out of 57 starters, 31 arrived at Dieppe.

In Class A the Bollee tricycle was the winner, averaging 24.5 miles an hour.

In Class B the Panhard carriage scored first, making a mean speed of 23 miles an hour.

The steam brake of De Dion & Bouton took the prize in Class C, averaging nearly the same as the Bollee.

In Class D a Delahaye wagonette was the winner, its time being 5 hours, 58 minutes, 13 seconds, or an average of 17.7 miles an hour.

Every assistance was rendered the organizers of the race by the Mayor and officials of the city of Dieppe, a fete being held in honor of the automobilists on their arrival, and a banquet in the evening.

Stanislaw Grodzki, of Warsaw, Poland, who drove his Peugeot carriage all the way from Varsovie, Russia, to Paris in 10 days, averaging 110 miles a day, and was to have participated in the race, arrived a few hours too late to enter. His carriage, though covered with dust, showed no ill effects from its long journey.

Many members of the Self-Propelled Traffic Association and the English Motor Press attended by special invitation, and the greatest of good feeling prevailed.

Paris-Trouville Motor Race.

Coming quickly after the Paris-Dieppe and Heavy Motor Contests, was the Paris-Trouville race, which was run on August 14, the distance being a little over 107 miles. It was purely a speed test and was participated in by both motocycles and motor carriages of the leading makes. The prizes, amounting to 11,200 francs, were contributed by wealthy patrons of the sports, among whom may be mentioned James Gordon Bennett and the Baron Zuylen de Nyevelt.

There were 64 entries in all, including one steam vehicle, a De Dion brake. Of the others Bollees and De Dion tricycles were most numerous. Many of those competing had already appeared in the Paris-Dieppe run, and had therefore become by this time experienced racers.

Out of the 64 entries, 48 came to the start and a lively emulation began. M. Jamin, who had won the Paris-Dieppe event on his Bollee tandem, was also successful in this, cutting down his time to 3 hours, 51 minutes, or an average of nearly 29 miles an hour. Other contestants showed equal improvement over previous records.

The festivities which had been arranged at Trouville were countermanded owing to a very serious accident which befell one of the racers near Trouville.

The second vehicle to arrive was a Panhard carriage with two passengers; the third a Peugeot carriage, also carrying two persons, and the fourth the De Dion steam carriage accommodating four persons. The next two machines were Panhards, and the seventh a De Dion tricycle, which covered the distance in 4 hours, 44 minutes.

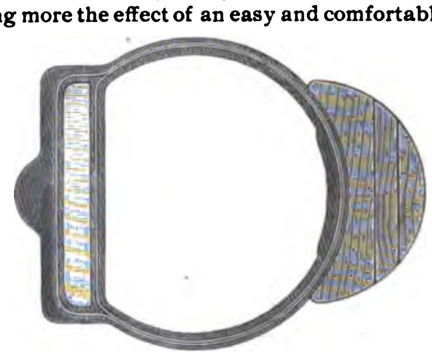
The Dreadnought Tire.

Under this very descriptive title a new punctureless pneumatic tire has recently been placed upon the market in New York City.

The puncture-proof qualities are said to be secured by an articulated tread band, consisting of pieces of wood having concaved sides and pivots between them, thus permitting perfect freedom of yield with the give of the tire, but preventing sharp-pointed projections from passing between the joints.

Resiliency is said to be just as perfect in the Dreadnought as in other first class tires. The articulated band shown above is enveloped in a bed of rubber, which is coated with a suitable fabric, the arrangement being such that the individual members of the band have free movement, enabling the pneu-

matic cushion behind to yield to the same extent as it would without this band; but the manner of yielding is different, for, whereas the ordinary pneumatic tire absorbs at its point of contact an obstacle as a stone in the road, the Dreadnought yields at its tread over an extended surface, and also yields freely at its side walls (specially prepared for this purpose), thus giving more the effect of an easy and comfortable cushion.



The rib which forms the tread portion of the tire upon a hard road, has, as will be seen, a very slight frictional contact with the surface, and no suction. Consequently, it is claimed that greater speed can be developed with these tires upon an ordinary hard surfaced or macadam road, and also upon a loose or sandy road, because the broad flat surface peculiar to this tire rides upon the top of the sand and does not drag through it like the ordinary round tread tire.

The Dreadnought Tire Co. have opened offices at 253 Broadway, and are prepared to supply the various sizes of tires needed for bicycles, and for both horse and motor carriages. F. W. Barker, the manager, reports that he has received some splendid indorsements from parties who have thoroughly tested these tires, and that among their recent orders is a large one from a prominent French manufacturer.

The Barrows Three-Wheelers.

For three years C. H. Barrows, formerly of Willimantic, Conn., has been studying to perfect a three-wheeled motor vehicle, the chief feature of which should be a "mechanical horse" in front drawing a vehicle box or body in the rear. The inventor now announces that he has overcome all difficulties and is ready to submit a perfected machine propelled by electricity, and weighing slightly over 700 pounds. It is constructed on the bicycle principle and will carry two persons very comfortably.

The vehicle illustrated on page 5 is for universal family pleasure riding and might be called an electric pony cart or electric horse and buggy. The forward wheel is practically an electric horse, as it is driven, guided, started and stopped very much in the same manner. It is 36 inches in diameter, with a three inch pneumatic tire, and carries a one-horse-power Riker motor and 300 pounds of special storage battery cells hung in springs below the axle. There is also 100 pounds of battery cells under the seat—twenty-four cells in all, which, with the motor and controller, makes the entire weight of the electric equipment about 500 pounds, 400 pounds being carried on the driving wheel, which transports it with less power than in any other way, and also utilizes the weight for driving traction. The motor is geared by a two and one-half inch rawhide pinion direct to a twenty-eight inch steel gear bracketed to the rim of the wheel.

The controller is mounted within immediate reach, and gives three speeds forward and two backward. It is as thorough and reliable as those in use on trolley cars; it is easily and instantly set to any speed desired up to the maximum—twelve miles an hour.

Steering is accomplished by simply moving the handle of the driving bar to the right or left.

To apply the brake the handle is raised, a slight pressure bringing the wheel under control, or if necessary the power can be thrown off, the wheel set and the vehicle stopped immediately.

The rear wheels are twenty-eight inches in diameter, with two-inch pneumatic tires. Ball bearings are used throughout.

Under ordinary circumstances Mr. Barrows states these vehicles will run about three hours or thirty to forty miles on one charge, according to load and the condition of the road. The battery may be charged in forty-five minutes if necessary, or when exhausted it may be removed and replaced by a fully charged battery in five minutes where continuous service is desired, as in delivery business, livery business, doctors' use, etc.

A company known as the C.H.Barrows Co. has been incorporated to manufacture these vehicles in all styles, for one, two, three or four passengers, and for light business purposes also. When desired the company will furnish two or three different bodies with the one "horse," so that the forepart may be attached to any one of them. Delivery wagons, speeding sulkies, doctors' carts and family rigs will be specialties.

The office of the C. H. Barrows Co. is at 302 West Fifty-third Street, New York.

O. H. P. Belmont, of Newport and New York, is so much pleased with the new motor carriage which he recently purchased that he intends to dispose of nearly all of his fine stable of horses and buy four more motor vehicles of different styles.

Carbonic Acid Gas Motors.

William L. Howard, of the Howard Cycle Co., Trenton, N.J., whose gasolene wagon was illustrated in the first number of The Horseless Age is now applying a liquid carbonic acid gas motor to a vehicle. The liquid is used under heavy pressure, varying from 1,000 to 3,000 pounds to the square inch, but strong claims are made for the motor on the ground of cheapness and efficiency.

The system employed is that exploited by the New Power Co. in New York some two years ago.

The engine weighs about 70 pounds and is said to develop a fraction over 15 horse power. Mr. Howard says he has run the wagon on good roads at a speed of nearly 34 miles per hour. He is building a second one, which will in every way be better than this; in fact, a regular racer. He thinks the question of power for this kind of a vehicle has been settled at last, as there is no danger, smell or dirt and the power is unlimited.

A company, capitalized at $5,000,000 is reported to have been organized in Baltimore, Md., for the manufacture of liquid carbonic acid gas for commercial purposes.

Coventry Motor Bicycle.

The Coventry Motor Co., Coventry, England, according to the *Autocar*, have designed a motor bicycle, which was recently tested by a woman cyclist in a ride from Coventry to London, the distance of 93 miles being accomplished in nine hours, over muddy roads, including time consumed in taking refreshments and supplies.

The machine is fitted with a one and one-quarter horse power inverted vehicle, gasolene motor, with tube ignition. In front of the motor is the gasolene tank having an indicator on the outside to show the amount of liquid within. A small carbureter prepares the mixture for the cylinder.

The frame is heavier and longer than the ordinary bicycle frame.

Power is transmitted by a direct application. The motor shaft is fitted with a small wood pulley about three inches in diameter and having a concave face which bears directly on he tread of the pneumatic tire of the back wheel.

Says the *Autocar*:

"This method of driving is, we understand, quite satisfactory, though, of course, it is not, at present at any rate, recommended for heavier vehicles than bicycles. The tire does not seem to suffer, and lends itself particularly well to the arrangement, as after the pulley has been properly adjusted to the tire face with the tire a little soft, an extra 'bite' can be obtained by pumping the tire up hard to full road-riding presure."

The Cycles of Gas and Oil Engines.

BY MR. JAMES D. ROOTS.

No. 1.

(From the London *Engineer*.)

The words "internal combustion engines" contain a fairly approximate descriptive definition of gas and oil engines; and for the latter period of these motors—for the whole may be conveniently divided into two periods, that before and that subsequent to the introduction of the Otto engines—this title is possibly the best that can be devised, yet as these words will necessarily include gunpowder, gun-cotton and all similar fulminating engines, it is not sufficiently accurate for a paper upon the cycles of these motors.

The words "explosive engines" are excluded for the like reason, for in using gun-powder and gun-cotton the working pressure is produced by the decomposition of the explosive into gases, and the presence of air is not essential to its operation. In gas and oil engines air is essential to the decomposition of the explosive. The old title, therefore, of the Patent-office, "air and gas engines," is a very correct one, so far as it goes.

To include powder and gun-cotton engines in this category would be not only to widen the field of the subject considerably—and it is a sufficiently wide one as it is—but it would take us back to the year 1256, and ascribe to Roger Bacon, or else some ancient and unknown Chinese worthy, the invention of the gas engine. The words "gas motor" contain in themselves a sufficient definition to exclude powder engines. M. Witz has endeavored to show in a manner characteristically French that the Abbe Hautfeuille was the inventor of the gas engie, because he published some ideas upon a gunpowder motor. Upon the same reasoning, the cannon used at Crecy were equally if not more practicable and workable gas engines. On the other hand, the Barber patent, which is given as the earliest invention in the English works upon the subject, is only a fanciful, and as far as I can judge as impracticable a motor, from the modern standpoint, as the steam engine of Hero of Alexandria.

I have therefore excluded from this paper all powder and gun-cotton engines, although those in Class 3 sometimes approach closely to the hot-air engines, and some of them are decidedly on the borderland between the internal combustion engine and hot-air engine. I have also excluded from consideration all engines not possessing a cylinder and piston.

The classification of the cycles of gas and oil motors necessitated the reading through carefully, in addition to the known works upon the subject, the patents dealing with the subject ot cycle from the earilest time up to the end of the year 1894—a task I should have recoiled at had I realized the necessity for it before having collected many notes and written considerable portions of the paper.

The inventive faculties of inventors have worked in such riotous profusion in the matter of cycles, the variations have been so many, so wide, and so ingenious, that it is often a matter of extreme difficulty to arrive at what the inventor means.

I had thought that I might have adopted the classification in one of the known works upon this subject. In the "Gas Engine," by Mr. Dugald Clerk, and in his last paper read before the Institution of Civil Engineers, upon "Recent Developments in Gas Engines," these engines are divided into three types, which are in effect similar to the division of the classes I have adopted; but on an examination of Mr. Clerk's definition of type 1—"engines igniting at constant volume without compression"—it will be seen that though this is true as a rough theoretical approximation, yet it is impossible in practice to ignite at constant volume. The flame takes an appreciable interval of time to pass through the explosive mixture of gas and air, during which interval the piston is moving at its greatest velocity, the volume during ignition is therefore continually changing. If the ignition in this cycle were to take place at the dead point of the stroke, it might be possible to effect ignition at almost constant volume; but taking place at from one-third to one-half of the stroke, there must always be an appreciable relative interval of time between the commencement and the completion of the ignition. Flame passes through a mixture of gas and air at atmospheric pressure much less rapidly than through a compressed mixture.

The following is an indicator card of this type of cycle, taken from a Hugon engine, by Prof. Tresca, of Paris. The time taken to complete the ignition is clearly shown by the rise of the ignition line. If the ignition had been at constant volume, the ignition line would have been a vertical one, as it is in the indicator diagram of the atmospheric engine. Hirn says, in "The Theory of the Lenoir Gas Engine," "The gas mixture not only requires a certain time in order to become ignited, but there must be upon the beginning of the working stroke a certain interval ere the flame enters."

HUGON

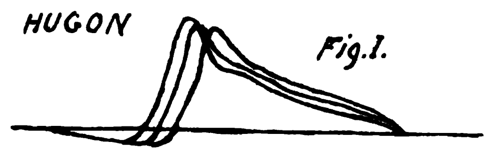


Fig. I.

With regard to type 3, the definition "engines igniting at constant volume with previous compression," is more accurate than that of type 1, as the ignition is usually upon or near the dead point in this class. There are, however, many engines that could not be included in either Mr. Clerk's or M. Witz's classification.

It appears to me advisable to classify the engines by revolutions rather than by stroke, because this classification by stroke of the engine ignores the strokes of the pump, an essential part of the cycle, the so-called two-stroke engine being generally in reality a four-stroke engine. On the other hand, if it be called a four-stroke engine, it is placed in the same category as engines of the De Rochas cycle, which would be clearly wrong.

The British Patent-office now classifies the compressio nengines by stroke, as also does M. Witz and M. Richard. Such well-known engines as the Stockport, Clerk, Midland, and engines of this class have in this classification their two pump strokes ignored, and these really, although the operations are carried out in two cylinders, are four-stroke engines. The Trent gas engine and engines of that construction are also of the same type, as they really possess two pistons in two cylinders of different diameter placed tandem.

My first intention was upon these grounds to classify the cycles by the number of revolutions per cycle solely, but the former objection would apply equally unless some explanatory subdivision were made.

The classification I have finally adopted is shown in the table or chart. It will be seen that so far as the first classification goes, the three main classes are in effect similar to those of Mr. Clerk and M. Witz. Mr. Clerk, however, places atmospheric engines as "type 1a," while M. Witz places them in a separate fourth class, together with others which he describes as mixed.

In 1884 and 1885 the British Patent-office classified internal combustion engine cycles by revolutions, and although this is undoubtedly a good method, yet the classification was coupled with a system of abridgment that formed a very elusive paradise for the searcher, and the system was subsequently very properly discontinued.

The Atkinson cycle engine would have presented a difficulty under the classification, as it is a four-stroke engine, yet is not upon the De Rochas cycle, as the strokes are of different length. The two extra or jumping strokes are obtained in one revolution and by the one piston by an ingenious mechanical device; it is therefore classed with the one-revolution cycles. Of course it may be urged that an engine consists of mechanical devices, nevertheless it is clear—and this may be taken as a definition of cycle—our consideration in every case must be the disposition of the working fluid in the engine and the processes it is subjected to before and after combustion.

I have endeavored in classifying to follow the line of fewest objections, and the classification followed was adopted after having tested and rejected five other systems of classification which I had drawn up.

Class 1 contains all non-compression engines. It is divided into two types, of which the first includes those engines in which power is "developed directly by explosion," and the second those in which "power is produced indirectly by atmospheric pressure."

Class 2 contains all compression explosion engines. These are divided into six different types of cycle, three of which are completed in one revolution, the first being "with the aid of a separate pump or pumps," type 3; the second, "with the use of the opposite side of the working piston as a pump," type 4; and the third, "without a pump," type 5. There is a subdivision of cycles of two revolutions, the well-known De Rochas or Otto cycle being the first of the two columns, type 6; the second, type 7, having a greater expansion, i.e., the working charge is expanded to a larger volume than it occupied a atmospheric pressure before ignition, and is so expanded in the same cylinder; these form types 6 and 7. The cycles of three revolutions are included in type 8, but neither the engines nor patents having three revolutions are numerous. At present the patents coming under type 9 are also far from numerous, although in all probability the immediate future will see them enormously increased, when possibly some further subdivision will have to be made. Type 9 includes all inventions described in patents in which compounding is the leading idea of the specification. By compounding I mean the expanding the working charge in a second expanding and contracting chamber after ignition, and generally after it has done one, or a portion of one working stroke. There is no word in the English language that expresses an expanding and contracting chamber simply; the word "cylinder," unless it be expressly excluded, includes the combustion or clearance space also, which in some engines—the earliest Otto to wit—may include one-third more than the total cubic space swept through by the face of the piston in one stroke.

It is obvious that the compounding or further expanding may take place either in another cylinder, or in the same cylinder on the other side of the same piston, i. e., not in the same contracting and expanding chamber, although in the same cylinder. This type only includees those engines in which a further expansion of the working charge after ignition takes place in a second "contracting and expanding chamber," and not those in which a greater expansion, beyond that of the normal cycle, occurs in the same "contracting and expanding chamber."

Lastly, of Class 3 there is only one type or division. The engines of this class are of the continuous combustion type. There are many of them on the borderland between the internal combustion engine and the hot-air engine; there is, in fact, no very sharp line of demarcation. All internal combustion-engine cycles are thus divided into ten different types —under one or other which types I believe any gas or oil engine that has yet been invented would be classed. In the columns of the table are set down the chief patents of each year in any way relating to cycles since the commencement, 1794 up to the end of 1894. It must not be supposed that the lists contain all the patents of each year. They contain practically all the patents that relate to each type of cycle.

The names marked with an (e) are not taken from British patents, but from French works on gas and oil motors—chiefly those of M. Witz and M. Richard, to whom I am indebted for most of these names.

Those names marked (c) refer to specifications in which a special effort is made by the inventor to clear out all the products of the previous combustion, so as to ignite a practically pure charge.

The earlier specifications are frequently described as "Gas and Oil Motors," but those marked (b) refer to petroleum engines. Those marked (d) are those specifications in which a varying volume is compressed and ignited, or in which one of the chief points of the specification is an intention on the part of the inventor to vary the quantity of the charge compressed and ignited.

Between the years 1830 and 1850, there are some patents not included in the table, most of which would come under types 1 or 2, in which a charge of H_2 and O is exploded by an electric spark in a cylinder with compression.

It is not to be understood that there are precisely the same cycles in each type of the table; indeed, the cycles often vary considerably in each type—particularly those of type 5, "one revolution without pump."

No doubt it will be found that I have made some omissions in so long a task, but I believe that I have in the table a very large majority of the specifications and inventions referring to cycles of internal combustion engines between the year 1794 and the end of 1894.

(To be continued.)

Current Motor Literature.

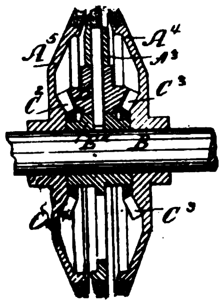
The *Engineering Magazine* for September contains an able article by W. Worby Beaumont on "The Present Status of the Horseless Carriage Industry." The paper is mainly historical, and deals quite thoroughly with all the principal types of motor vehicles now in use. Joseph Sachs, an electrical engineer of New York, also contributes an interesting article on the same subject to the current number of the *Journal* of the Franklin Institute.

Recent Gas Engine and Motor Patents.

586,825.—*Electric Motor.*—Frank A. Perret, Brooklyn, N. Y., assignor to Heber Stone, Brenham, Texas. Filed March 27, 1897. Serial No. 629,513.

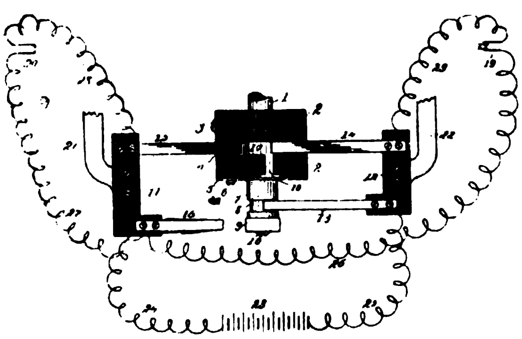
586,826.—*Explosive Engine.*—Frederick A. Redmon, San Francisco, Cal., assignor to Bambridge L. Ryder, same place. Filed Oct. 9, 1896. Serial No. 608,345.

587,713.—*Apparatus for Transmitting Rotary Motion.*—Edward K. Dutton, Harrogate, England. Filed Dec. 11, 1896 Serial No. 615,384. Patented in England, May 16, 1896. No. 10,523.



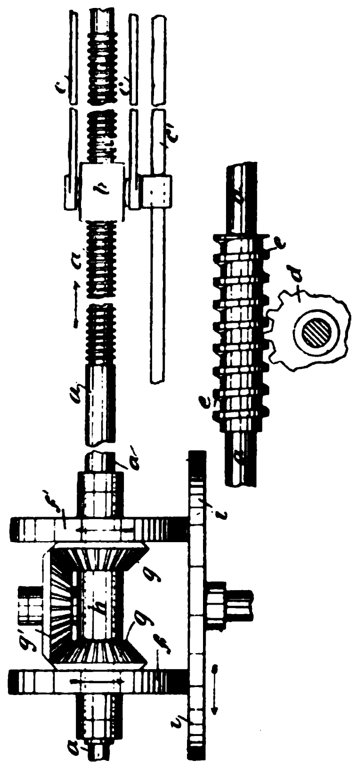
Claim.—In dish and friction-wheel gearing, the combination of six friction wheels, having a common axis, arranged in two sets, each comprising three wheels, a bevel gear carried by the central wheel in each set, gears on the two outer wheels in such set meshing with the bevel gears, the two center wheels, a set of bevel balance gears connecting the two center wheels in the two sets, the intermediate gear in such balance gears revolving upon an axis radial from the common axis of all the six friction wheels, such radial axis being carried by a part fixed upon the shaft upon which the entire combination is mounted.

587,747.—*Igniter for Explosive Engines.*—Philip Mueller, Decatur, Ill. Filed Dec. 18, 1896. Serial No. 616,133.



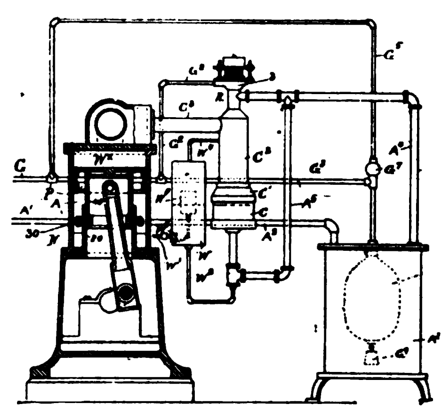
Claim.—In an igniter for explosive engines, the combination of a rotatable shaft insulated from the engine and communicating with a source of electrical energy, a segment of circular contact surface made up of alternate sections of conductor and non-conductor, such segment being rotable with the shaft and in electric communication therewith, a plurality of stationary contact surfaces at regular intervals around and contiguous to the path of the segment, a wire leading from each stationary contact surface to a pole piece of a sparker, and other wires leading from the opposite pole pieces of the sparker back to the source of electrical energy.

587,714.—*Road Locomotive.*—Edward K. Dutton, Harrogate, England. Filed Jan. 6. 1897. Serial No. 618,193. Patented in England, June 6, 1896. No. 12 379.



Claim.—In combination with the motor vehicle the longitudinally movable shaft, the driving gearing therefor arranged to be set by the longitudinal movement of the shaft, means for moving the shaft back to normal position as it is rotated by the gearing, whereby said gearing and shaft are rendered inactive, and a connection between the shaft and the part of the vehicle to be operated.

588,293.—*Heat Engine.*—Sidney A. Reeve, Worcester, Mass., assignor to Charles F. Brown, trustee, Reading, Mass. Filed Feb. 1, 1897. Serial No. 621,389.



Claim.—The combination of a combustion chamber, means for admitting air and gas to said chamber under pressure, said means including an annular series of air ports and an

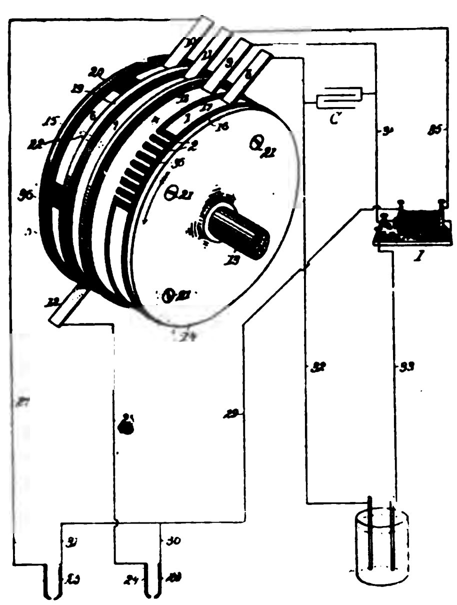
annular series for gas ports, the two series being separated by an annular space, an annular plunger movable in said space, and provided with a series of outlet ports arranged to coincide simultaneously with the gas and air parts and to cover and uncover the same, a gas shut off valve connect with said plunger, a pressure actuated diaphragm connected with said valve and plunger, and a regulating valve having pressure-controlled means for simultaneously varying the flow of air and gas, and for dividing the air supply, a partial supply being mixed with the gas within the valve, and an additional supply within the combustion chamber.

588,449.—*Petroleum Burner.*—Hugo Kretschmann, Berlin, Germany. Filed Oct. 3, 1896. Serial No. 607,795.

588,466.—*Combustion Engine.*—Augustus G. Pace, New York, N. Y. Filed Feb. 12, 1897. Serial No. 623,067.

Claim.—A combustion-engine, comprising a casing having a cylinder and a combustion-chamber, a piston operating in the cylinder, a gas-supply for the engine, a fixed sparking-point in the combustion-chamber, a rotary sparking-point in the combustion-chamber, a source of electricity with which said sparking-points are engaged, a gear-wheel of insulating material operated by the engine, a metal block on said gear-wheel, a pinion engaging with the gear-wheel and comprised in the electric circuit, a metal ring on the gear-wheel, and a brush engaging the said ring and with one of the wires of the electric circuit, substantially as specified.

588,629.—*Igniter for Explosive Engines.*—Leon Bly, Decatur, Ill., assignor of one-third to Elbert E. Johnson, same place. Filed Dec. 26, 1896. Serial No. 617,078.



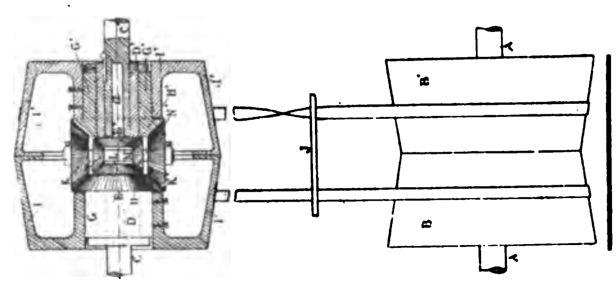
Claim.—In an igniter for explosive engines, a rotatable cylinder having two collector-rings, a plurality of groups of contact-points connected electrically with one of the collector-rings, a contact-surface, wider than a group, connected electrically with the other collecting-ring, a brush in contact with each of the collecting rings, a brush bearing against the cylinder in position to strike the groups of contact-points, a source of electrical energy, an induction-coil, a condenser, and a plurality of igniters, one terminal of the source of energy being connected with the brush that strikes the groups, the other terminal of the source of energy being connected with one terminal of the primary winding of the induction-coil, the other terminal of the induction-coil being connected with the brush resting on the collector-ring that communicates with the groups, the condenser being connected in parallel between the brush that strikes the groups and the brush of the collector-ring communicating therewith, one terminal of the secondary winding of the induction-coil being connected with the brush of the collector-ring that communicates with the contact-surface, the other terminal of the secondary winding of the induction-coil being connected with one terminal of each of the igniters, a number of brushes in position to strike the contact-surface, such number depending on the number of igniters, and connections between each of such brushes and a terminal of an igniter.

588,667.—*Oil Retainer and Distributer for Hollow Rolls of Roller Bearings.*—Theodore J. Tellefsen and Charles S. Lockwood, Newark, N. J., assignors to the Hyatt Roller Bearing Co., of New Jersey. Filed Oct. 24, 1896. Serial No. 609,-983.

588,672.—*Motor Worked by Hydrocarbon or Other Gases.*—Christopher T. Wardsworth, Manchester; Edmund Wiseman, Luton, and John Holroyd, London, England. Filed Nov. 23, 1896. Serial No. 613,177.

Claim.—In a hydrocarbon-motor the combination of the cylinder, a heated chamber at one end thereof through which the heated products of combustion are discharged, passages for air and vapor disposed around the heated chamber, a partition between the cylinder and the heated chamber having numerous openings connecting the heated chamber with the surrounding passages and a central opening which serves both to admit the charge to the cylinder and for the discharge of the products of combustion thereform, admission and exhaust valves, and means for operating them.

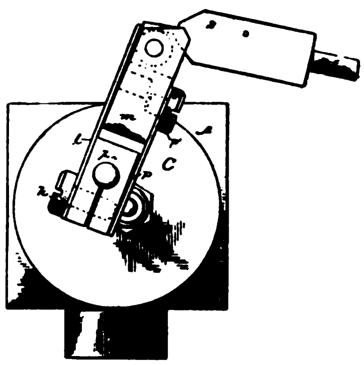
588,856.—*Differential Gearing.*—Albert De Dion, Georges Bouton and Frederic Chaplet, Paris, France. Filed May 23, 1897. Serial No. 628,914. Patented in France Jan. 3, 1895. No. 244,094.



Claim.—The combination with the driving-shaft A and the reversely coned pulleys B, B', fixed thereon, of the shafts C, C', journaled together, the sleeves D, D', fixed thereon and provided with gear-wheels E, E', the sleeves G, G', loosely journaled on the sleeves D, D', and provided with gear wheels H, H', cone-pulleys I, I', reversely inclined to one another and to the pulleys B, B', and fixed on the sleeves G, G', gear-wheels K, K' loosely mounted on the opposite end of a shaft L and gearing with the wheels H, H', gear-wheels N, N', journaled on said shafts L and gearing with the wheels E, E', a straight belt O connecting the pulleys B, I, a crossed belt O' connecting the pulleys B', I', and a belt shifter for simultaneously shifting said belts.

588,876.—*Gas Engine.*—Charles Quast, Marion, O. Filed Sept. 5, 1894. Serial No. 522,180.

588,917.—*Igniter for Gas Engine.*—Charles White and Arthur R. Middleton, Baltimore, Md. Filed April 11, 1895. Serial No. 545,286.



Claim.—In an electric igniter, a movable electrode, an extension thereof, a bearing in advance of said extension and a reversible slide having a central tongue and inclined shouldered portions in rear thereof at top and bottom, said shoulders varying in extent to actuate the electrode earlier or later, substantially as described.

589,001.—*Motor Vehicle.*—Gotthold Langer, St. Louis, Mo., assignor of three-fourths to Charles J. Ranch, Memphis, Tenn.; John Schmelzer, Centralia, Ill., and Joseph B. Mermann, St. Louis, Mo. Filed Aug. 31, 1896. Serial No. 604,487.

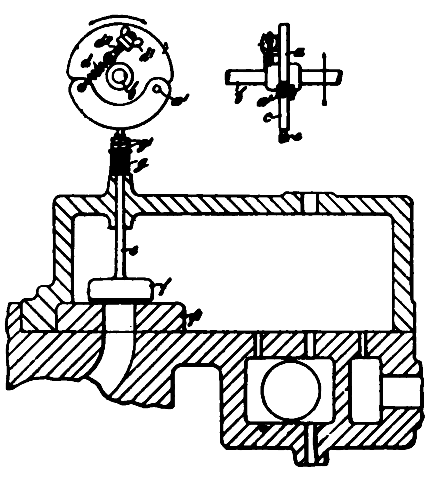
589,094.—*Carbureter.*—Jacob Ormerod, London, England. Filed June 25, 1896. Serial No. 596,906. Patented in England, June 11, 1894. No. 11,256.

589,105.—*Motor.*—Henry H. Vaughan, St. Paul, Minn. Filed Oct. 17, 1896. Serial No. 609,238.

589,108.—*Motor Worked by Hydrocarbon or Other Gases.*—Christopher T. Wardsworth, Manchester; Edmund Wiseman, Luton, and John Holroyd, London, England. Filed Nov. 23, 1896. Serial No. 613,176

589,150.—*Gas Engine.*—John C. Wilson, Allegheny, Pa. Filed Sept. 11, 1896. Serial No. 605,545.

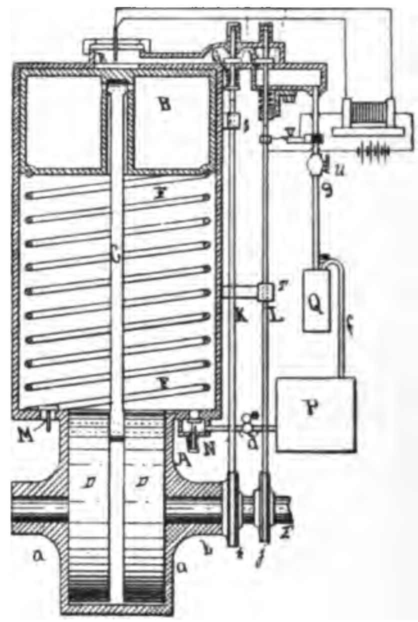
589,335.—*Gas Engine Governor.*—Robert Caldwell, Auckland, New Zealand. Filed Oct. 30, 1896. Serial No. 610,566.



Claim.—In combination, in a gas-engine, the inlet-valve and a governor comprising a rotary disk having a centrifugal part carried thereby bearing directly on the valve-stem, substantially as described.

589,634. *Carbureter.*—Daniel Best, San Leandro, Cal. Filed Jan. 21, 1897. Serial No. 620,132.

Claim.—In a carbureter for gas-engines, the combination of a series of superposed pans having flanged openings made alternately at opposite sides of the pans, intermediate partitions extending across the pans from nearly one side to the other, forming close joint at the bottom with the pan and extending close up to the top thereof, whereby the air passing through the openings is distributed over the surface of the



liquid in the pans, a surrounding casing with air-inlets delivering air into the uppermost of the pans, connections between the lowermost pan and the engine-cylinders, whereby the explosive gas or vapor is drawn into the cylinders by the strokes of the piston, exhaust-passages upon each cylinder with pipes extending upwardly through the pans, whereby the contents are heated and vaporized when the engine is in operation, supplemental fireplaces situated below the pans and adapted to receive the fuel so that the apparatus may be heated before starting the engines.

585,651. *Gas Engine.*—Franz Burger, Fort Wayne, Ind., assignor of three-fourths to Henry M. Williams, same place. Filed March 26, 1894. Serial No. 505,505

585,652. *Gas Engine.*—James A Charter, Beloit, Wis. Filed Sept. 26, 1896. Serial No. 607,087.

585,952. *Starting Mechanism for Gas Engines.*—Simeon Colley, Sr., and Simeon Colley, Jr., Springfield, O. Filed Feb. 27, 1897. Serial No. 625,263.

586,084. *Motor Carriages*—James F. Duryea, Springfield, Mass., assignor to the Duryea Motor Wagon Company, same place. Filed May 11, 1896. Serial No 591,068.

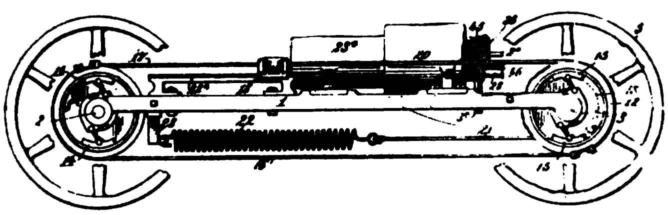
Claim.—In a motor vehicle, in combination, a muffling device, consisting of several cylinders of varying diameters having closed ends, said several cylinders being contained one within another, several hollow cones having cone-shaped perforations therethrough secured to the interior of the innermost of said cylinders and in axial alignment therewith, and

a series of cone-shaped perforations through the sides of said cylinders disposed as regards the ends thereof, whereby the gases passing through said muffling device are caused to follow a zig-zag course.

587,760. *Steam Engine.*—Leon Serpollet, Paris France, assignor to La Société des Generateurs á Vaporization Instantancé (System Leon Serpollet), same place. Filed June 4, 1896. Serial No. 594,322. Patented in France Nov. 8, 1895, No. 251,540.

588,061. *Gas Engine.*—Henry C. Hart, Detroit, Mich., assignor to the Henry C. Hart Mfg. Co., same place. Filed May 17, 1894. Serial No. 511,532.

Claim.—The combination with a free-flying piston engine of pulleys having shafts and connected at the top and bottom by flexible connections, a connection between the piston and a part of said flexible connections, whereby the pulleys are oscillated when the piston reciprocates, a spring placed under tension by the flight of the piston, and a clutch by which one of the shafts is rotated in one direction by the oscillatory motion of the pulleys.



The combination with a cylinder and a piston, of an oscillatory inlet valve disk or plate having ports and a spindle, a dish or plate secured to the spindle, and having radial contact faces, and a reciprocating rod having a stud adapted to strike against either of said radial contact faces to oscillate said valve dish or plate, the radial contact faces being arranged a sufficient distance apart so that the stud is susceptible of some motion between said contact faces.

588,062. *Gas Engine.*—Henry C. Hart, Detroit, Mich., assignor to the Henry C. Hart Mfg Co., same place. Filed Dec 28, 1806. Serial No. 617,205.

Claim.—The combination, with a gas engine cylinder. closed at both ends, and having an air inlet and an air outlet at one end, a piston working in the cylinder, a compressed air reservoir and means for converting air withdrawn from the reservoir into explosive mixture, of a passage way leading from the said air outlet of the cylinder to the compressed air reservoir and having an adjustable valve for varying the quantity of air which flows there through from the cylinder to the compressed air reservoir.

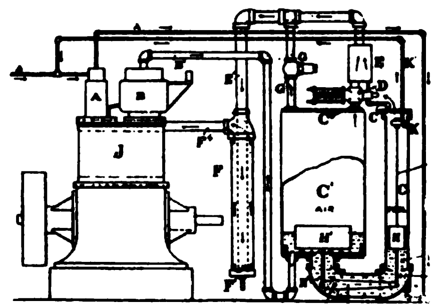
588,296.—*Air Compressor.*—Ira H. Spencer, Hartford, Conn., assignor to the Spencer Motor Co., same place. Filed Oct. 21, 1896. Serial No. 609,514.

586,409. *Gas or Vapor Engine.*—Eugene P. Woillard, Sugden, Fla. Filed April 15, 1896. Serial No. 587,625.

586,479. *Electrc Igniter for Gas Engines.*—Harry S. Dosh, Baltimore, Md, assignor to George F. Obrecht and George Scheibing, same place. Filed Feb. 17, 1897. Serial No 623,781.

586,511. *Igniter for Explosive Engines.*—Edward J. Pennington, Racine, Wis., assignor to Thomas Kane, trustee, Chicago, Ill. Filed May 13, 1895. Serial No. 549,039.

588,178.—*Apparatus for Utilizing Liquid or Gaseous Fuel for Power.*—Sidney A. Reeve, Boston, Mass., assignor to Charles F. Brown, trustee, Reading, Mass. Filed Dec. 15, 1894. Renewed Jan. 16, 1897. Serial No. 619,498.



Claim.—The combination of a combustion chamber, a conduit leading therefrom for the products of combustion, an air reservoir and a fuel reservoir connected, with the combination chamber, a supplemental outlet or by-pass connecting the air reservoir with said conduit and provided with a vielding valve adapted to release into said conduit any excess of air pressure over the pressure of the products of combustion in the conduit, a supplemental outlet or by pass, connecting the fuel reservoir with the source of fuel supply, a liquid sealed connection between the two reservoirs, a valve controlling the by pass or supplemental outlet of the fuel reservoir, and connections between the valve and the liquid seal, whereby the valve is opened by an excess of pressure in the fuel reservoir.

Australasia Patents.

Messrs. Phillips, Ormonde & Co., consulting engineers, patent and trade mark agents, of 169 Queens Street, Melbourne, Victoria, Australia, supply us with the following specially prepared list of applications for letters patents in Australasia in connection with motor vehicles and the like:

C. V. Potter, of Neptune Street, St. Kilda, Victoria, for "An improved engine applicable to motor cars and other purposes."

F. G. Wilson, of the Australian Auto-Car Co., of 108 Queen Street, Melbourne, Victoria (Assignee of Marcel Certain, of South Melbourne, and E. P. Chatelain, of Melbourne) for "An improved motor for propelling horseless carriages and similar vehicles."

H. Tarrant, of 87 Grey Street, East Melbourne, Victoria, for "Improvements in Explosion Motors operated by gas, oil and like fuel."

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

A SUCCESSFUL INVENTOR AND DESIGNER of Gas, Gasolene and Kerosene Motors, for stationary and road purposes, desires a situation in which he can have a moderate salary and an interest in his inventions. Address "OHIO," care THE HORSELESS AGE.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

A Splendid Opportunity.

Mr. Joseph J. Kulage, of Kulage Place, College, near Blair Avenues, St. Louis, Mo., the inventor and patentee of the unique and interesting Motor Vehicle mentioned in THE HORSELESS AGE, which vehicle in every vital point is believed to be superior to any style or type of horseless carriage known, desires to build and manufacture his Vehicle at the earliest possible date, and being unable on account of his present engagements to devote his entire time to said enterprise, would in connection with a desirable party or parties organize a corporation with a capital stock of $25,000, and subscribe for $10,000 or $15,000 of said stock himself. The location of works in one of the Eastern States is considered preferable.

WANTED CAPITAL—To build and patent a new power Transmission for Motor Wagons. Will be gladly used by all motor wagon builders on royalty; will give 40 per cent. of patent. WESLEY KOUNS, Salina, Kans.

GASOLENE engines for motor carriages, cycles, launches, etc. Light, compact, powerful, reliable. Two actual horsepower, $135; three, $165; four, $225. Other sizes. Two old style 2 H. P. motors, $90 each; guaranteed good. A. D. STEALEY, 1353 26th Avenue, Oakland, Cal.

Designs and Estimates Wanted for the Following Horseless Vehicles:

One Enclosed Parcel Delivery Wagon. One Baggage and Express Wagon. One Pleasure Vehicle, seating from ten to twelve persons. Grades, 5, 7 and 12 per cent. The Roads for the Pleasure Vehicle will be the hardest for travel, being at times sandy, with ruts and holes, and short pitches of a 12 per cent. grade. These Vehicles must contain the best material and be guaranteed for not less than twelve months. All suggestions that will tend to make the best and most desirable Vehicles are asked for and will be received with thanks. Estimates for each Vehicle must be separate.

R. M. DALE, 861 Eighth St. San Diego, Cal.

G. H. EDWARDS, 519 Carroll Avenue, Chicago, patentee of the Trussed Tractor, illustrated in the March number, wishes correspondence with parties who take an interest or manufacture the same. It is the result of several years of experiment on the farm. It does the work at one-eighth the cost of horses.

FOR SALE.—Horseless Carriage, $600; cushion tires, gasolene motor. OWEN BROS., 472 E. Prospect Street, Cleveland, O.

WANTED.—To buy Horseless Carriage; send photo or cut of same; state motive power, speed of carriage and where it can be seen. Address "J. M.," Post-office Box 95, Hamilton, Ontario.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.
Price $3.00
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A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.
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Auto-Cars, Cars, Tramcars and Small Cars. By D. Farman. Translated from the French by L. Serraillier. Preface by Baron de L. de Nyevelt. 258 pages, 112 illustrations, 12mo., cloth.
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A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.
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Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.
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IN PREPARATION.

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

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AMERICAN MOTOR LEAGUE.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. II. NEW YORK, SEPTEMBER, 1897. No. 11.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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The Hybrid Motor Vehicle.

In spite of the experience of the past two years in America, and the lessons to be learned by the much wider range of European examples, many of our inventors still seem unable to forget the horse. The different conditions to be met by the motor vehicle are lost sight of, and in consequence of this fundamental error, we see nondescript creations, mere patchwork which cannot be expected to give practical results. If we are to work intelligently it is absolutely essential that we should have a clear understanding of the problem. This cannot be gained by inspiration or by a superficial examination, but is the reward of careful investigation and thought.

Attention was called to this matter in THE HORSELESS AGE nearly two years ago, and since that time scores of "horrible examples" have appeared in its pages, but like Banquo's ghost the old horse vehicle will not down in the inventor's mind.

First meet the mechanical conditions, then please the eye. Most of our inventors are doing neither.

The Diesel Gas Engine.

All students of the gas engine have been on the tiptoe of expectation for news of the gas engine on which Herr Diesel has been engaged for several years. We therefore take pleasure in laying before our readers a summarized translation of the inventor's own exposition, reprinted from the London *Engineer*. An economy heretofore unknown in either steam or explosive engines is undoubtedly obtained by the Diesel method, and in large powers a wide field may be open for it, but as the construction involves greater complication and weight, it is not available for vehicles.

Back Numbers.

Parties having Nos. 1, 2, or 3 of Volume I., or Nos. 6, 7, or 8 of Volume II., which they are willing to exchange, should send them to the office of THE HORSELESS AGE, as current or future issues will be given in return for them, number for number.

New "Coventry Motette."

The *Autocar* of recent date gives a description of the latest design of this vehicle, which the Coventry Motor Co., Coventry, England, are now turning out.

The machine they have hitherto made is an improved Bollée—a most efficient little carriage in every way, but the great objection to it is the position of the back rider, which, although well enough in fair weather, is by no means an ideal position when driving in wet or very cold weather, as he is compelled to keep one leg on either side of the central case which runs down the machine, and in which the transmission gear is enclosed, and unless he swathes his legs in many garments, and wears boots of uncommon proportions, it is impossible to keep his feet warm or his knees dry. The front seat is right enough, as the rider can have a rug, and generally make him-

COVENTY SOCIABLE MOTETTE

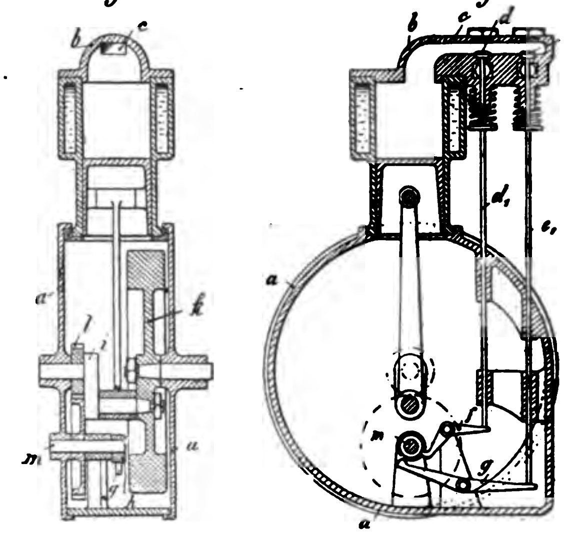
self cosy. Of course, conversation is not carried on quite so easily as is the case when the riders are side by side, and this is what Mr. McRobie Turrall has borne in mind in designing the sociable pattern illustrated. So far as the framework, arrangement of the wheels and the motor are concerned, they may be dismissed for the time being with the statement that they are practically the same as on the latest pattern of the Coventry Motette, the great difference being in the comfortably shaped and sprung body of the carriage. The steering is between the two riders, so that it is easily undertaken by either occupant. The steering on this machine is now positive—the handle being moved in the same direction it is desired the machine shall go, which is a considerable improvement in the hands of a novice.

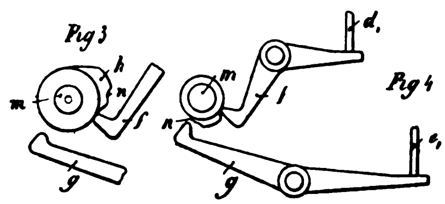
Bicycle Motor of M. Baris-Loutzky.

This motor, which is the invention of an engineer of St. Petersburg, Russia, is of the Otto cycle. All the moving parts are located in a closed case, *a*, upon which is the cylinder, *b*. The inventor is of the opinion that in bicycle motors, generally of less than one horse-power, it is necessary, in order to obtain a reliable ignition, to employ a straight ignition canal, and a mixture as rich as possible.

In the cuts the exhaust valve is situated in the mouth of the ignition canal, *c*, in front of the admission valve, *e*, so that during the period of compression there is at the end of the canal, *c*, over the valve, *e*, only an absolutely pure mixture.

Fig. 1. Fig. 2.





The rods of the valve, *d* and *e*, are in the same plane as the axis of the cylinder, *b*, and in order that the two valves, *d* and *e*, situated one behind the other, may be conveniently controlled, the corresponding levers, *f* and *g*, ought also to be in the same vertical plane and to be operated by the same cam, *h*. To obtain this result the lever, *f*, is placed in front of the lever, *g*. The ramps of the two levers are arranged at 90 degrees and the common cam, *h*, therefore serves for both exhaust and admission valves.

In motors which are provided with mufflers to deaden the noise of the exhaust, it has been found that the muffler exerts a counter pressure upon the exhaust. To overcome this, in the Loutzky motor the exhaust valve is opened before the period of expansion, to allow part of the gas to escape. To accomplish this the cam, *h*, is provided with a shoulder, *n*, which operates the lever, *f*, while the shorter foot of the lever, *g*, is not affected by the notch, *n*.

To gain from the crank shaft, *i*, set in two bearings of the case, *a*, is attached on one side to the fly wheel, *k*, while on the other is the pinion, *l*, which engages with another pinion on the shaft, *m*, controlling the distribution *i*. Hence the whole mechanism is enclosed in the case, *a*.

Big Electric Cab Company Formed.

The Electric Carriage & Wagon Co., which has been operating the electrical cabs in New York, has been merged into the Electrical Vehicle Co., of New Jersey, having an authorized capital of $10,000,000, of which $5,000,000 is common and $5,000,000 preferred stock. The incorporators are Gustave Kissel, of Kessler & Co., bankers of Wall Street; Philip Leman and Edward Tuck.

The company will put over 100 additional cabs in service as soon as possible.

Automatic Speed Changing Mechanism.

M. Maugras, a French inventor has brought out an automatic speed changing mechanism, in which the relation of the speed of the motor shaft to that of the axle of the drive wheel is regulated by the work to be performed.

A is the motor shaft. By means of the pinions, R_1 and R_2, the shaft *g*, carrying a governor *R*, and a disc *f*. Through the gear wheel, R_2 and R_1, the same shaft *A* turns the shaft B_1, which is one of the parts of the axle of the driving wheels.

Upon the disc *f* bears eccentrically the disc wheel *c*, which in its rotation revolves the rod *a*, in its bearings *b* and b_1. This rod has an endless screw *W*, which by means of a drum turns the wheels S_1 and S_2, and consequently the shaft B_2, constituting the other half of the axle of the driving wheels. B_1 and B_2 are connected with the differential *D*.

Suppose the wheel *e* is in such a position that the motion which the endless screw communicates to the shaft B_2, is just the same as that of the shaft B_1. If, because of the nature or inclination of the road, the driving wheels offer less resistance, the speed of the motor will tend to increase. The regulator *R* draws the cone *V* to the left, and the rod *q* descends and closes the opening *Q*. In this position compressed air supplied from a small pump operated by the motor, instead of passing out through the opening *Q* rushes into the tube *p* and in the cylinder *S* lowers the piston *T* which has a tendency to rise owing to the action of a spiral spring.

It will be seen that the lowering of the piston *T* has the effect of reducing the eccentricity of the disc wheel *e* which is shifted along the rod *a* by means of a groove or feather. But, as the wheel *e* moves from the center of *f*, it is revolved less rapidly, and in consequence, the endless screw *W* also slackens its speed.

The differential *D* then plays its part and the drive wheels receive a movement resulting from the difference in the speeds communicated to B_1 and B_2. Thus the speed of the motor is regulated.

By means of levers the operator controls the mechanism by lowering the wheel *e* or opening a valve which allows the compressed air to enter.

In a vehicle propelled by electricity instead of compressed air simple contacts *H* and H_1, controlling *J* in the coils II_1, would be substituted.—*La Locomotion Automobile.*

The Sintz Motor Carriage.

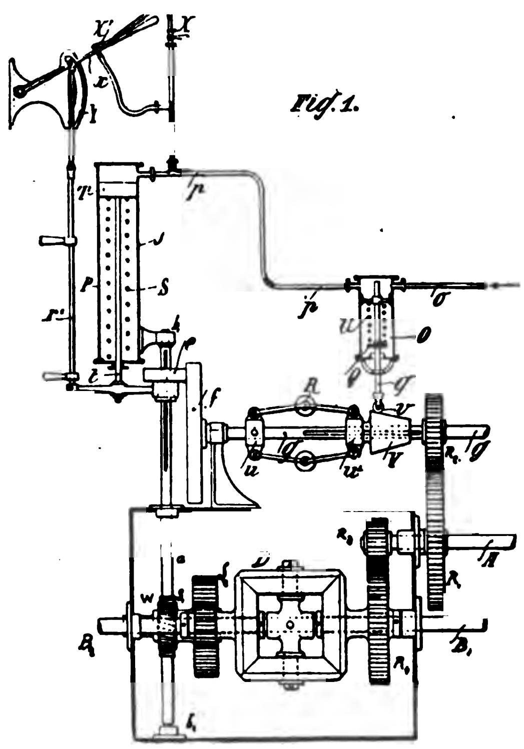
The Sintz carriage herewith illustrated, is equipped with a six horse-power double cylinder, Sintz gasolene motor and the variable speed mechanism of the Reeves Pulley Co., Columbus, Ind.

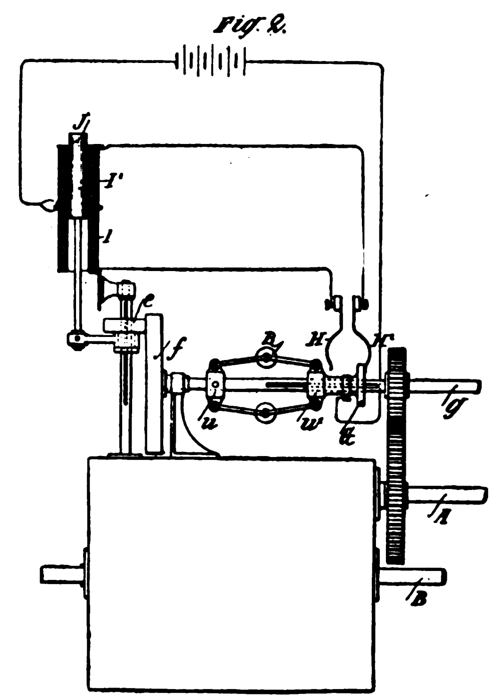
The Sintz Co. state that on good roads it will make twelve miles an hour, and climb any hill that is encountered. They have never yet found mud or sand too deep to pass through. They have probably made 1,000 miles with it since they have had it in use.

The Bergmann Carriage.

The American Motor Co., Havemeyer Building, New York, have recently imported this vehicle the details of which were fully illustrated in the February issue of the THE HORSELESS AGE. It was manufactured by Carl Bergmann, Gaggenau, Germany, and has several novel features in the transmission and the carbureter.

The Winton Motor Carriage Co. Cleveland, O., have a new model for 1898, which will commend itself both to the eye and the judgment of the purchaser.





SPEED CHANGING MECHANISM OF M. MAUGRAS.

BERGMANN MOTOR CARRIAGE. S BERGMANN, GAGGENAU, GERMANY.

GASOLENE MOTOR CARRIAGE. SINTZ GAS ENGINE CO., GRAND RAPIDS, MICH.

Petroleum Bicycle of Bouilly & Tenaud.

This motor bicycle, described in a recent number of *La Locomotion Automobile*, differs little in appearance from the ordinary machine, as it is provided with pedals. The motor is located on the frame in front, and the frame is reinforced.

The motor is thrown into or out of gear by means of a brake lever and a U-shaped piece fastened to the motor and upon which the shoe of the brake impinges when the lever is pressed.

The brake lever has a spring hook by means of which the motor can be stopped and the pedals alone used.

A small crank is used to set the motor in motion. The pedals are then brought into requisition, and the gear thrown in by the brake lever.

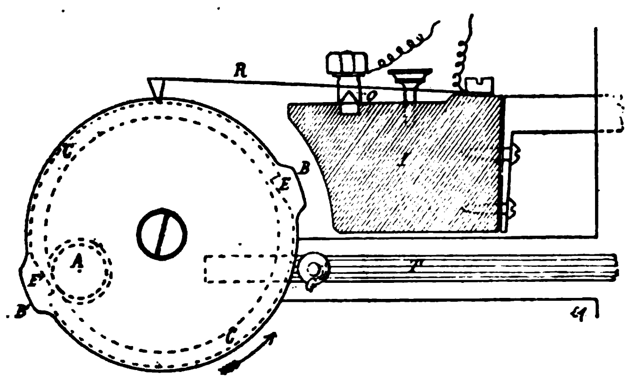
When desired the feet may be placed upon the foot rests.

A single valve, located between the saddle and the steering post, regulates the admission of air. A float in the petroleum reservoir insures a uniform mixture in the carburetor. At one of the extremities of the lever controlling the mixture is a flexible metallic tube communicating with the admission valve.

The exhaust valve is controlled as follows, the same disposition also regulating the ignition and permitting the speed of the motor to be varied from 500 to 1,500 revolutions:

Close to the handle bar is a button which regulates the position of the spring, R, with reference to the notches E and E^1

A commutator at the left side of the handle bar regulates the electric current. Speed is varied in the following manner:



At A is the motor shaft carrying a pinion which engages with the toothed cylinder C, of four times the diameter. This cylinder forms a dust protector for the gears. On its exterior are two cams, BB^1, corresponding to the two notches EE^1. At every revolution the cams raise the exhaust through the medium of the pulley G and the strap T.

At each revolution of the notches E, E the spring R touches the point O, and produces the spark in the cylinder.

The insulated piece I carries the spring and its adjusting screw, and by shifting this insulated piece the moment of ignition may be varied.

The weight of the machine is about ninety pounds. The speed attained is from seventeen to twenty miles an hour, but by assisting the motor with the pedals a speed of nearly twenty-five miles an hour may be attained.

Recent improvements have been made which give still better results. The cylinder having been rebored, the motor shows up more power and the power is applied to the wheel directly through a belt. The pedals are so arranged that they can be thrown out of gear while the motor is doing the work, and thus serve as foot rests. The tension of the belt is governed by a lever convenient to the hand. Two brakes, one in front and the other in the rear, give perfect safety.

By varying the ignition and tightening the belt, speed may be varied from three to twenty-eight miles an hour.

The Latest Anglo-French Motor Van.

The special feature of this motor van, which has been accomplished after exhaustive experiments, and is now protected by patents, consists of installing the motors and propelling mechanism in a rigid frame quite independent of the body. This frame is provided with anti-vibration spring cushions relieving the motors and mechanism both from the shocks of the road, and also from those of the explosions. The motors are of the horizontal enclosed type having self-lubricating chambers, conical adjustable bearings and easily replaced liners. They develop eight actual horse-power when running at 400 per minute. The electric ignition effects considerable saving in the current, as it is provided with automatic-timing mechanism, whereby the period of ignition may be adjusted to give best working results and prevent premature firing when starting the motors, which operation is quickly performed by means of a safety handle applied to a belt disc. The propelling mechanism consists of direct belt driving from the motor axis on to a geared countershaft which transmits the power to the back axle of the van through the medium of a single chain drive on to the central portion of the solid axle, which is provided with ordinary compensating gear. All working parts are lubricated from a chamber having tubes directed to their respective parts.

The system of cooling is by forced circulation from a small pump operated by the propelling mechanism. This forces the water through the cylinder jackets, tubular condenser and tanks. It will be seen from the cut that the appearance of the van is all that can be desired and that its entire capacity is available for storage of goods. The weight of the body and mechanism is well distributed, the van is easily controlled and has ample power to cope with steep grades.

Acetylene Motors.

Some successful tests with regard to the application of acetylene to the production of power have been recently carried out by M. Cuinat, of Paris, whereby it has been ascertained that acetylene can be employed for operating ordinary gas engines without necessitating any alterations, except a reduction in the size of the valves. Acetylene is found to develop three times as much energy as ordinary illuminating gas. The explosive mixture used consists of ten parts of air and one part of acetylene. M. Cuinat estimates the consumption of eight to sixteen horse-power motors at no more than 160 litres (56.5 cubic feet) of this mixture, and the cost of horse-power per hour, according to the present price of calcium carbide, at 3d.—*The Autocar*.

DELIVERY WAGON OF THE ANGLO-FRENCH MOTOR CARRIAGE CO.

PETROLEUM BICYCLE OF BOUILLY & TENAUD.

Riker Electric Victoria.

The accompanying illustration shows a very handsome electric vehicle, recently built by the Riker Electric Motor Co., for a citizen of New York. It carries two passengers, has a child's seat besides, and weighs all told 1,700 pounds.

The frame is of 1¼ inch steel tubing. The front wheels are 28 inches and the rear 32 inches, and Hartford pneumatics of 2¼ inches diameter are employed; as also the usual pivotal steering.

The motor, 1½ Ku., weighs 142 pounds and is geared to the axle by a spur gear nine to one.

The battery, composed of forty Willard cells, weighs 800 pounds; has a capacity of 100 ampere hours at a five hour discharge rate; and can be recharged in three hours.

The vehicle is controlled from the seat, like the trap already described in our columns, except that in this case the controller handle is between the two passengers and is operated by the right hand, while the bell is operated by a push button fixed in the end of the steering handle.

Mr. Riker reports that this victoria has been run 600 miles about New York City at a total cost for current, of $10.35, computed at regular Edison station rates.

The Riker Co. are now building, on order, four traps, three doctor's buggies, two delivery wagons and a brougham.

Carbonic Acid Carriage Motor.

The New Power Co., who own the patents of the carbonic acid motor invented by Lewis B. White, have started a factory on Meade Street, Trenton, N. J., and are building their first lot of motor carriages, the one illustrated in our last issue being merely an experimental machine weighing several hundred pounds more than the new model.

The liquid gas is to be stored in the tubular frame of the vehicle and maintained at a standard temperature of 90 degrees by means of a flame generated from "sestalit," a well-known patent fuel, a small quantity of which will last for twenty-four hours. Hence the heavy retaining cylinders previously used are avoided.

The motor, which weighs but seventy pounds, and is said to generate fifteen horse-power, is placed on the frame and connected with the rear axle by means of a telescope rod. The motor runs as high as 2,000 revolutions per minute, and is controlled like a locomotive.

The difficulty hitherto experienced with carbonic acid gas, when used for power, has been that the rapid evaporation would cause the valves to freeze. This difficulty the company claims to have overcome through a new valve which positively cuts off the current from the retaining cylinder at every stroke.

One lever only is used for steering and regulating speed, while a second is required for reversing the motor.

The company report that they are about to install a cab plant in New York, consisting of forty cabs, which will be supplied with the liquid gas at a central station, to be built at a cost not to exceed $3,000. The acid will be drawn off from the storage tanks like water.

The company, which is capitalized at $5,000,000 under the laws of Illinois, is officered as follows: President, Leon Abbett; Secretary and Treasurer, John Briggs; Mechanical Engineer, Lewis B. White, and Superintendent of Wagon Construction, W. L. Howard, of the Howard Cycle Co., Trenton, N. J.

The Worthley Steam Carriage.

C. A. Worthley, 111 Milk Street, Boston, Mass., is building a steam carriage for his own use. It is of tubular steel frame with tangent wire wheels, made by the Weston-Mott Co. The forward wheels are 34 inches in diameter and have ball bearings, while the rear wheels are 36 inches and have plain bearings. They are fitted with 2¼ inch Hartford pneumatic tires.

The rear axle is composed of 1¼ inch tubing. Transmission s by sprocket and chain, the sprocket being 13 inches in diameter and being placed on a box containing the compensating gears. Four Hub Roller Bearings are used on the rear axle.

The engines will be placed under the seats and enclosed in a dust-proof case. The boiler will contain 270 copper tubes, and will also be placed out of sight. Both fuel and water supply will be automatic.

Three chains will be employed in transmission, two running from the crank shaft to a countershaft, which in turn drives the main sprocket chain.

An air alarm and air brake will be used.

Steering and speedchanging will be controlled by one lever, while a second lever operates the alarm and the brake, either independently or simultaneously.

Both water and steam gauges are within plain view of the operator, whose attention will be directed to any change, however slight, in the water level or steam pressure, by the ringing of a buzzer.

An automatic pump furnishes the air for the brake and the alarm.

In design the vehicle will resemble a trap.

New Motor Fire Apparatus.

The Fire Commissioners of Hartford, Conn., are looking about for a motor hose cart, so satisfactory is the record of the self-propelled fire engine they have had in service for several years. While investigating this matter they have run across a novelty in fire engines which interests them greatly. The engine is a storage battery affair and can be run out at short notice and go at high speed. It is lighter by the weight of a boiler than a steam fire engine, for it does not depend upon its own power for pumping after it reaches the scene of duty. It is intended only for duty in the city territory, where there is electric service, and on arriving at a fire simply connects with an electric wire and runs its pump as a trolley car runs its motors.

A public test of the Aaltham motor carriage was made on Commonwealth Avenue, Boston, Mass., the other day. The test was declared to be quite successful, though the first model exhibited a number of defects which will be remedied in vehicles now under construction. The motor is of the gasolene variety, and the most noteworthy points about the inventor's work are said to be the discarding of the water jacket and the method of applying the power direct.

ELECTRIC VICTORIA. RIKER ELECTRIC MOTOR CO., BROOKLYN, N. Y.

The Diesel Oil Engine.

SUMMARIZED TRANSLATION BY B. DONKIN, M.I.C.E.

(From the London *Engineer.*)

The *Zeitschrift des Vereines deutscher Ingenieure*, July 10, 17, and 24, 1897, contains a long paper, with drawings and experiments, on this engine, the invention of Herr Rudolph Diesel, called a "Rational Heat Motor." For several years Herr Diesel has put forward a claim which he is now in a position to substantiate, that his oil motor, by its peculiar process of combustion, utilizes the heat supplied to it to greater advantage than any other. Our existing methods of obtaining power are admittedly wasteful, although economy of combustion is one of the pressing industrial questions of the day. The heat efficiency of our present engines using saturated steam is 12 per cent. or 13 per cent. for triple-expansion engines above 1,000-horse power, 9 per cent. for compound engines of 150 to 200-horse power and upward, and 5 per cent. or 6 per cent. for small condensing engines up to 50-horse power. Considering that for more than a century the utmost efforts of scientific men and engineers have been devoted to perfecting the steam engine, these figures are not encouraging.

Heat Efficiency of Steam Engines, etc.—The cause of failure is the dissipation of heat in the successive processes for turning it to account. Heat is lost during evaporation, the boiler efficiency not being more than 80 per cent., in the theoretical efficiency of the engine, which cannot be more than one-third of the heat supplied, if steam be used as the motive power; in the indicated efficiency, or quantity of heat changed into indicated work, or power exerted on the piston; and, lastly, in the mechanical efficiency, or heat actually turned into work, less the friction of the parts. These four efficiencies, as yielded by a 700-horse power triple-expansion condensing engine of the latest Sulzer type, built by the Maschinen-Fabrik, Augsburg, and by a Schmidt engine with high boiler pressure, and steam superheated to 350 deg. Cent., are tabulated in Herr Diesel's paper, and give a mean heat efficiency of 13 per cent. The author, Herr Diesel, is of opinion that it will not be possible greatly to increase this limit in steam engines, based as it is on a boiler efficiency of 80 per cent. and a mechanical efficiency of 85 per cent. Nor could any small increase in efficiency much affect the radical diasdvantage of the steam engine, namely, its low theoretical heat efficiency. Even if a maximum could be attained in practice, only 30 per cent. of the heat given to the engine would be turned theoretically into work. The three evils of steam engines may be thus summarized: (1) The use of steam to drive the piston, in generating which, from 20 per cent. to 30 per cent. of the heat is lost; (2) the low theoretical efficiency; (3) the sensitive nature of steam, the influence upon it of the metal walls of the steam passages and cylinder, and the rapidity with which it condenses.

It is not surprising that a better utilization of combustibles than is afforded by our present methods is one of the most urgent topics of the day, and is occupying many minds. For more than fifteen years the author has been engaged on various experiments with different heat-producing agents. His first trials with an ammonia motor, giving a large working range of temperature, proved that highly superheated vapors, whatever their nature, cannot be properly utilized, unless a correspondingly high difference of pressure is available, to allow them to expand. Otherwise the steam or vapor is still superheated at the end of expansion, and a portion of the heat put into it is wasted. It is possible to determine theoretically the pressures necessary to utilize this superheat; they should be from fifty to sixty atmospheres. As ammonia vapors were very difficult to handle at these pressures, the author was led to use air as a simpler pressure agent. Theoretically the same results were obtained, and it was found that to utilize to the utmost a high range of temperature, a correspondingly high range of pressure is necessary. These two conditions cannot be separated. At first the air was treated in closed vessels, and heat applied and withdrawn externally; but before long it became evident that not only could the air be compressed and used to procure the requisite pressure, but also that the heat could be generated by combustion in the cylinder itself—a method long since employed in internal combustion motors. The principles at which Herr Diesel had thus arrived were set forth in his book: "Theorie und Construction eines rationellen Wärmemotors. Berlin: J. Springer. 1893." Translated into English by Bryan Donkin, M.I.C.E., and published by Messrs. Spon, London. 1894.

New Process of Combustion.—The chief points forming the groundwork of the new method are the following: In every process of combustion a distinction must be carefully drawn between the temperature of ignition and the temperature of combustion. The first is practically constant, and depends only on the physical properties of the combustible. The higher the pressure, the lower this temperature of ignition. The temperature of combustion, on the other hand, is variable—always much higher than that of ignition, and depends on many conditions, but chiefly on the quantity of air supplied. Hitherto the temperature of combustion has been produced after ignition, by and during the process of combustion itself. Starting from theory, Herr Diesel has evolved a new method of what he calls "rational combustion," for which four conditions are essential.

(1) The temperature of combustion should not be produced by and during combustion, but before and independently of it, entirely by the mechanical compression of air. This apparently contradictory idea, which involves a complete reversal of our present notions of combustion, is really grounded on the Carnot process.

(2) It is essential that the air be compressed adiabatically only, and not at first isothermally, as required by the perfect process. In this way it is possible to raise the air to the temperature of combustion by pressures much lower than those required in the perfect Carnot cycle—say, from thirty to fifty atmospheres only. It is by reason of this departure from the pure theoretical cycle, in which pressures of from 100 to 200 atmopheres, and more, are required, that it becomes possible to carry out the method of combustion at all. An impossible is replaced by a practical working cycle.

(3) The air being thus already raised by adiabatic compression to the temperature of combustion, the combustible must be injected into it by degrees in such a way that the heat developed by gradual combustion is converted into work as it is produced, by reason of the corresponding expansion of the air and gases driving out the piston. If this be done, combustion will produce only a very slight, if any, rise in temperature.

(4) The fourth condition also contradicts our present theories. It has hitherto been held that the excess of air for

Fig. 1

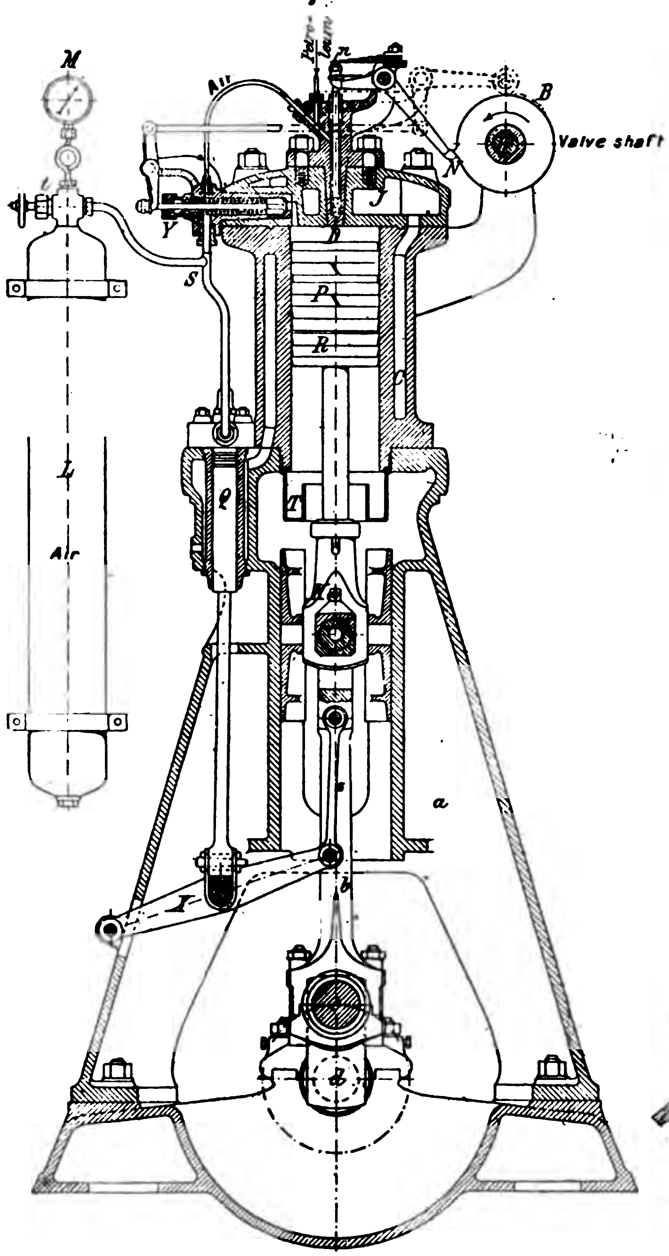
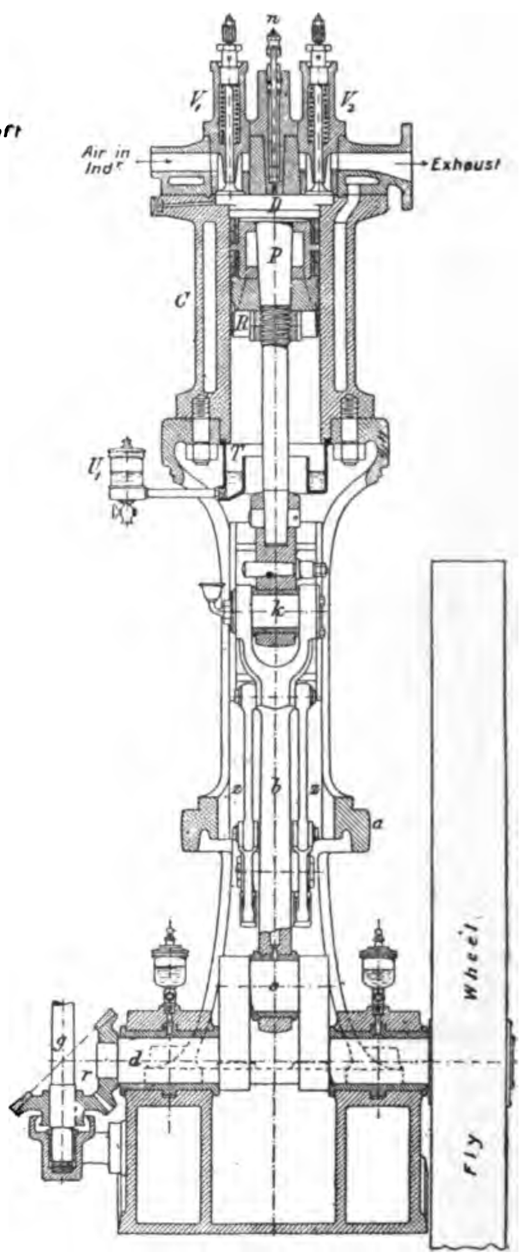


Fig. 2



"The Engineer." Swain Eng.

DIESEL OIL ENGINE.

combustion should be reduced within the smallest limits. With the author's method, on the contrary, a large excess of air is required, but this surplus quantity is carefully regulated, and the amount previously determined for each kind of combustible.

In the paper in the *Zeitschrift des Vereines*, etc. above referred to, a graphic diagram is given to illustrate the method. The air is first compressed, and at the same time greatly raised in temperature; combustion then takes place gradually, and as the piston moves out, driven by the expansion of the air and gases, combustion and expansion are almost isothermal, and without increase of pressure. The admission of the combustible is then cut off, the air and gases continue to expand until the exhaust valve opens. By varying the time and duration of admission, or the period of cut-off, the shape of the expansion line, and area of the diagram, and hence the work done, can be modified.

Proposed Compound Engine.—To carry out the principles above set forth, the author proposed a four-cycle process, divided between three vertical inverted cylinders, side by side, the two outer being motor and combustion cylinders, and the inner for compression, expansion, and exhaust. The three cylinders are connected to each other, and to a reservoir of compressed air. The motor plunger cranks are set at an angle of 180 deg. to the cranks of the central cylinder, and all three pistons work downward on to the cranks. Air is first drawn into the central cylinder, slightly compressed, and sent on to the receiver. The two plunger pistons then draw it into the motor cylinders at the top during their first down stroke, and compress it further in the second up stroke to the requisite pressure and temperature. During the next down stroke (3) the combustible is gradually introduced at the top, and burns as the piston moves out or descends. The combustible is assumed to be powdered coal, admitted through a revolving valve, but hitherto it has only been found practicable to utilize pulverized oil for the purpose. When the piston has moved through about one quarter of the stroke, the supply of combustible is cut off, and the air and gases of combustion continue to expand. At the end of the stroke a valve at the top of both cylinders opens communication with the central clyinder. The next up stroke (4) of the motor pistons forces the air and gases, still at a considerable pressure, into it; the central piston is driven down, and the air beneath it is compressed. In the return stroke of this central piston the exhaust valve at the top of the cylinder opens, and the products are discharged to the atmosphere. The whole process is thus accomplished in two revolutions for the three pistons, or four strokes, and the cycle is similar to that carried out in internal combustion engines. It is shown in a table with three parallel columns, one for each piston. This will be found at page 54 of Diesel's book (English translation), already mentioned. By using two motor cylinders, a combustion or working stroke is obtained at each revolution.

The advantages of this arrangement are many. Considering it first from a theoretical point of view, the boiler efficiency is equal to unity. According to Herr Deisel, the possible theoretical efficiency is from 50 per cent. to 70 per cent., and therefore double that of a steam engine, and the indicated efficiency must also be much higher, because the air and combustible gases do not condense like steam, and the heat being generated in the cylinder itself, there is no loss in passages, pipes, etc. On the other hand, the mechanical efficiency must be lower, on account of the very high compression. Some critics have even maintained that it would be so small as to outweigh all other advantages of the new engine. These were, however, so obvious that Herr Krupp joined the movement in its favor, and the Maschinen-Fabrik, Augsburg, agreed to test the principles on which it was based, by constructing an experimental single-cylinder vertical motor driven by liquid fuel. Powdered coal, although at first sight offering such a simple and efficient combustible, has not been found practicable at present, and it was considered advisable, if coal was to be used at all, to convert it first into gas.

Twelve Horse-Power Experimental Engine.—The vertical single-acting single-cylinder inverted engine first worked at Augsburg resembled a gas engine in construction and design. The piston was above, acting downward in the usual, way through a connecting-rod on to the crank. An auxiliary or valve shaft, driven from the crank shaft by means of conical wheels carried two cams opening respectively the oil and air valves, which were held on their seats by springs. The working cycle in this and the succeeding engines is as follows: (1) The piston, driven down by the momentum of the fly-wheel, draws in atmospheric air through a valve at the top. (2) The piston rises, the air valve closes, and compression takes place till the air is at a sufficiently high pressure to attain the temperature necessary to produce combustion. Both temperature and pressure are regulated by the stroke of the piston, or the size of the clearance space. (3) Piston descends (motor stroke), oil admitted and injected into the air at high pressure from a small oil pump, the stroke of which is regulated by three different cams on the auxiliary shaft, giving a cut off at 2 per cent., 5 per cent. or 10 per cent. of the stroke. Thus gradual combustion is obtained after cut-off, and the air expands till the piston reaches the lower dead point. (4) Piston rises, exhaust valve opens, and air and gases of combustion are discharged to atmosphere; the cycle then recommences. The engine is started by connecting it to a receiver of compressed air, which is filled by the motor itself while running. There is no light, or ignition burner, and combustion is spontaneous.

Water Jacket.—The new motor was worked at first without a cooling jacket, but it was afterward found desirable to add one. The water jacket is not, however, a necessary evil, as some think, but is required theoretically to carry off part of the heat, and in Herr Diesel's opinion, all efforts to diminish greatly the losses of heat under this head are futile. There is only one right way, according to him, to secure this object, namely, to choose such a process of combustion that more heat than at present is absorbed in doing work; then, even on theoretical grounds, there will be less to carry off. As the new method required high pressures, temperatures, and speeds, the lines of existing engines could not serve as models, and almost every detail was the result of long and patient study, extending over two years. At the end of that time a second engine of the same size, embodying various improvements, was constructed, which, although far from perfect, gave surprisingly good results, and ran for months with oil and with lighting gas, to furnish power for part of the Augsburg Maschinen-Fabrik. As the result of these different trials, a new 20-horse power petroleum engine was made, and tests on it were begun in the early part of this year, 1897. No experiments appear to have been published concerning either of the two 12-horse power engines.

Twenty-Horse-Power Experimental Engine.—This latest engine—see Figs. 1 and 2—does not differ much from those

already described, except that the valve shaft is at the top, and the cylinder and covers have a water jacket. It is vertical, inverted, single cylinder, single acting, and similar in external construction to an ordinary oil motor. C is the cylinder. The piston P acts downward through connecting-rod *b* on to the crank *c* below. The valve shaft W, driven by bevel wheels from the crank shaft, carries several cams opening respectively the oil valve *n*, the air valve V₁, and the exhaust valve V₂—Fig. 2. Another cam works the valve V for starting. A small vertical air pump Q, also water jacketed, and driven from the connecting-rod by levers X and *z*, forces air under pressure into the receiver L at the left hand side of Fig. 1.

By means of the branch pipe S from L the same pressure, which is much above that in the motor clynider, is maintained in the injection nozzle D, to which the petroleum passes through the small central needle valve *n*. By varying the pressure in the receiver, and the stroke of the air pump, the admission of oil can be accelerated or retarded, and the progress of, combustion thus regulated.

In the *Zeitschrift*, etc., a large number of drawings and indicator diagrams are given, illustrating the successive improvements in the engine from 1893 to 1897. They were obtained under various working conditions, the engine being driven with benzene, petroleum, lighting gas, volatile vapors, and mixtures of fluids and gases. By means of these diagrams the author distinguishes six periods in the evolution of the engine. In the first, the explosions were violent, and the indicator pencil much disturbed; the trials were even attended with some danger. During the second, the experimenters succeeded in making the engine run empty continuously, combustion became steadier and quiet; and although the areas of the indicator diagrams were practically nil, they gave promise for the future. An attempt was next made, and shown in the third set of diagrams, to inject the combustible in quantities corresponding theoretically with the travel of the piston, but this was found to give negative results. It was therefore abandoned, and better diagrams followed in Period IV. Period V. showed a gradual but steady improvement. Combustion was irregular at first, but became less fluctuating, and the engine ran for several months without stopping. Period VI. marks its completion. The indicator diagrams were obtained by Professor Schroter during his trials, described below, and the changes produced by varying the cut-off are marked in them in the same way as in a steam engine. An interesting set of indicator diagrams are given in the original paper, showing graphically the comparative merits of three different heat motors. These diagrams are superposed, one over the other, and taken respectively from a marine steam engine, a Grob oil, and a Diesel oil motor, all of the same dimensions and power, and to the same scale. The area of work in the last is much the greatest.

Tests.—Experiments were made on this new 20-horse power engine in February, 1897, by representatives of the Krupp, Sulzer, and Deutz firms, and by Professors Schroter, Gutermuth, Sauvage, and others. Most of the trials lasted several days, and the engine was put to the test in every possible way. These experiments confirm Herr Diesel's statement that the efficiency of his engine is higher than that of other motors. The boiler efficiency is equal to unity, there being none. The theoretical possible heat efficiency varies from 50 per cent. to 70 per cent., and is about twice as high as is possible in the best steam engines, and half as much again as in internal combustion motors. This in part explains the superiority of the new engine, especially when made compound as described. The indicated efficiency, or the percentage of heat actually turned into indicated work, is 70 per cent. to 80 per cent. of the maximum theoretical possible efficiency, while the mechanical efficiency is 71 per cent. to 75 per cent. The results obtained in the tests made on other oil engines by Professor Hartmann, and those of the Diesel motor, when running at full and half-power, and empty, are represented in a comparative graphic diagram, in which the abscisæ are the volumes of stroke per second, and the ordinates the consumption of petroleum per brake horse-power hour. This diagram shows that in the Diesel motor the consumption increases very little as the load diminishes, and is practically constant within certain limits, because the thermal efficiency rises as the work decreases. Perhaps one of the most important characteristic of the engine is its small dimensions, as compared with other explosion motors, being much less in size for the same speed and power. The mean available pressure is also higher, the area of work, as shown by the indicator diagrams, is larger, and hence the cylinder dimensions less. It was at first thought that the very high pressures of air would necessitate heavy connecting-rods, levers, and crank shaft, but it is now found that these can be lighter than usual.

The performance of the engine is regulated by the cut-off, that is, the period during which oil is admitted, and it responds quickly to the governor. No explosions are missed, and this is an advantage as compared with internal combustion motors, one of the chief drawbacks of which is their irregularity in running. The engine is always ready for work, and no dirt or grease collects on the internal surfaces, because combustion is complete. No arrangement for ignition, either electrical or by flame or hot tube, is required, nor is there any vaporizer or pulverizer. Unlike the steam engine, it gives practically the same results, whether made large or small, and therefore no object is gained by centralizing the power, nor need it all be supplied for many purposes from one engine, with the consequent disadvantages of long and expensive shafting. Of course, the chief recommendation of the Diesel motor is its low consumption of oil, which is only one-half pound per brake horse-power hour, under normal working conditions.

Experiments have already been made with petroleum and lighting gas, and the Augsburg Maschinen-Fabrik are testing the motor with ordinary hard coal, and are now constructing a 150-horse power compound experimental engine, with generator for driving it with cheap or power gas. The oil trials made by Professors Schroter and Gutermuth showed a heat efficiency per indicated horse-power of 34 per cent. to 35 per cent., or 50 per cent. more than is obtained in gas engines when working at maximum power. Further, the engine is new, and capable of greater development. If power gas from a generator be used, there is of necessity a loss of heat in the generator, which only converts about 80 per cent. of the heat in the coal into gas; but improvements in this direction may be expected, especially if the gas be compressed to 40 or 50 atmospheres.

The latest experiments with the 20-horse power engine show a consumption of 0.47 pound oil per brake horse-power hour. Herr Diesel's views are confirmed by Professor Schroter, who considers that the theoretical principles on which the engine is constructed have been justified by the result. In most new inventions, engines have first been built,

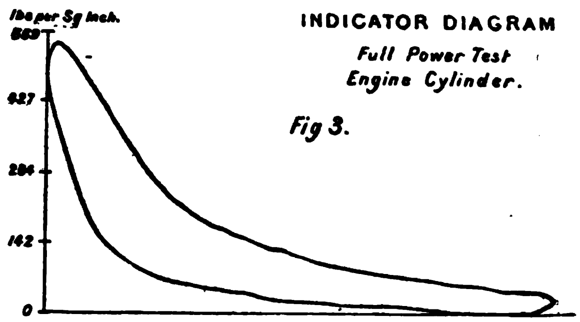


Fig 3.

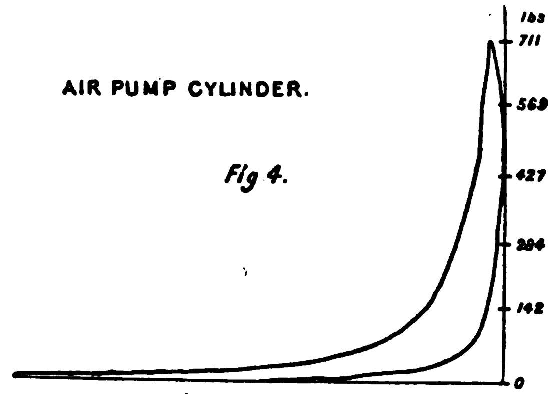


Fig 4.

and their theory deduced afterwards; with this engine the contrary course has been successfully followed.

Prof. Schroter's Trials on a 20 hp Diesel Engine.—The engine constructed by the Augsburg Maschinen-Fabrik was tested by Professor Schroter under the following heads:—Indicated and brake horse-power, consumption of petroleum, quantity of cooling jacket water, and heat imparted to it, and temperature of the exhaust gases. Arrangements were also made to determine the chemical composition of the exhaust gases, and heating value and composition of the petroleum, and the results checked in the Technische Hoch Schule at Munich. Both the motor cylinder, in which the ordinary four cycle was carried out, and the single-acting air pump were indicated. The piston diameter in the motor cylinder was 9.8 in., and stroke 15.7 in.; diameter of the air pump piston, 2.7 in., stroke 7.8 in. The indicator springs were previously carefully tested, and the mean values obtained were taken. The scale adopted was one millimeter per atmosphere. The efficiency was assumed to be the difference in indicated work shown by the motor cylinder and air pump indicator diagram. There were five trials in all, two at full, two at half-power, and a fifth while running empty. Each lasted one hour. Fig. 3 gives an indicator diagram taken during a full power trial; Fig. 4 an indicator diagram from the air pump or negative work. During the two experiments at full power the revolutions per minute were respectively 171 and 154; the governor was fixed during each trial, and no variations in speed were allowed. It was shifted for each fresh experiment. The mean pressure in the motor cylinder was 7.4 atmospheres 108 pound per square inch; indicated horse-power 26.5 and 23.6 respectively—deducting the air pump indicated horse-power. This difference in power in the two cases was due to the different speeds. A brake was applied, and gave for the first trial 19.8 brake horse-power, and for the second 17.8 brake horse-power, or a mean mechanical efficiency of 75 per cent. Prof. Schroter remarks that "all his co-workers were surprised at the simplicity of the engine, and the ease with which it was started" by connecting it to the receiver, where the pressure was always forty atmospheres. He considers that "it ran so quietly and steadily that it was difficult for an outsider to realize the forces brought into play." No difficulty was found in preventing leakage from the receiver.

Consumption of Oil, Heat Value, Etc. —The petroleum was taken from a carefully gauged can, duly weighed before and after each test, and the consumption found to be 0.54 pound and 0.52 pound per brake horse-power, and 0.40 pound and 0.39 pound per indicated horse-power per hour respectively for the two full power trials. For the two trials at half power, namely, at 9.5 brake horse-power, and 9.8 brake horse-power, the consumption was 0.61 pound per brake horse-power hour. These figures show that even now, in its earlier experimental stage, the engine is ahead of other oil motors, and while running at ordinary speed with normal full load, gives a consumption in round numbers of one-half pound oil per brake horse-power hour. It should be noted that the relatively increased consumption at half-power is only 15 per cent. The temperatures of the exhaust gases were taken behind the exhaust valve, those of the cooling water into and out of the jacket. The quantity of water was measured from time to time by observing the length of time required to fill a large tank, and the temperatures being simultaneously read off, the heat carried off in the cooling water jacket was thus approximately determined. The density of the petroleum used was repeatedly taken from both the feeding can and the supply tank, and was found to be about 0.80 when reduced to normal temperatnre. The mean composition of the oil was 85.13 per cent. C., 14.21 per cent. H., and 0.66 per cent. O.

The Pittsburg Motor Vehicle Company.

Under this title a company was incorporated, Oct. 2, under the laws of Pennsylvania, to manufacture motor vehicles of all kinds. At first, however, the company's attention will be entirely given to a tandem tricycle of moderate price and light construction, propelled by a gasolene motor which will exhibit several novel features.

The capital stock is $60,000, all paid in, and the officers are: Louis S. Clarke, president; James K. Clarke, treasurer; John S. Clarke, secretary, and William Morgans, manager.

A floor 80 x 145 feet has been rented in a fine building at the corner of Third Avenue and Ferry Street, and a catalogue will soon be issued.

Here's a Chance.

The Fifth Avenue Coach Co., operating a line of stages on Fifth Avenue, New York, wish to adopt motor stages, and are in the market for a suitable system. Inventors and manufacturers who think they can supply what is wanted, should communicate with W. G. Peckham, 111 Broadway, New York. It is expressly requested that negotiations be opened by correspondence

The Cycles of Gas and Oil Engines.

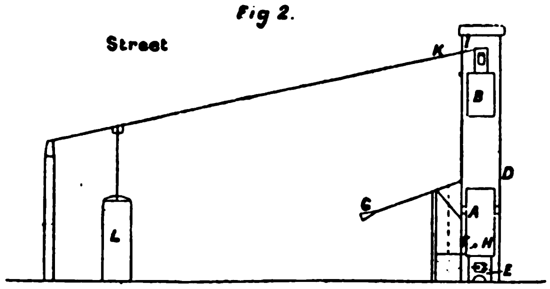
By Mr. James. D. Roots.
No. II.

(From the London *Engineer.*)

Robert Street may fairly be described as the originator of the internal combustion engine, since in his patent we have the first description of a practical and workable engine.

It is entitled "Method to produce an inflammable vapor force by means of liquid air, fire and flame, for communicating motion to engines pumps and machinery;" is dated May 7, 1794, and numbered 1983. It is on similar lines to most of the following engines on this cycle, except that the piston is connected to a beam instead of to a crank. It is a non-compression engine of type 1. The illustration accompanying the specification is a mere sketch, Fig. 2, but the description not only of the construction of the engine, but also of its working, is very clear and concise. I cannot do better than quote this part of the specification:

Fig 2.

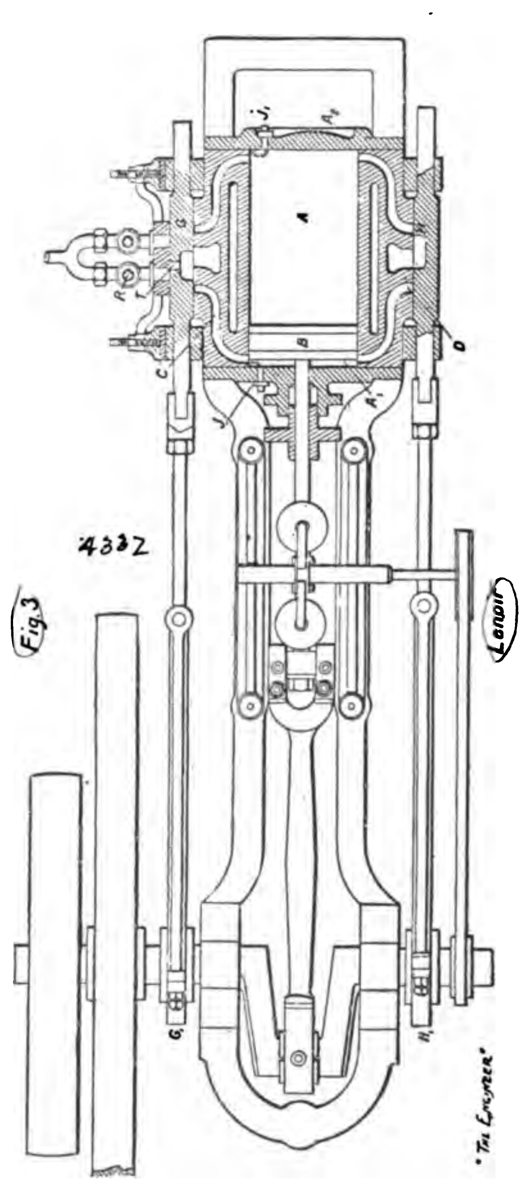


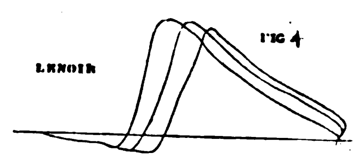
"*A*, an iron cylinder; *B*, a solid iron piston made to fit cylinder; *D*, a strong frame in which the cylinder is suspended; *E*, a stove to keep the bottom of the cylinder hot; *F*, a countersunk touch-hole, and near the bottom of the cylinder. As soon as the bottom is sufficiently heated, pour a small quantity of spirits of tar or turpentine into the funnel, which falls on the hot part of the cylinder, and instantly the liquid is converted into an inflammable vapor; at the same moment raise the piston by means of the lever *G*, which sucks in the external condensed air, and also raises a light to the touch-hole, the confined vapor takes fire similar to gunpowder, and by the combined power of inflammable and rarefied air thus incorporated together, forces the piston *B* up the frame, and also raises with it the long shaft *K*, which descends with the piston to the bottom, and works the pump or other machinery at the opposite end at *L*. The two sides of the frame, Fig. 2, are made hollow, like a groove, to guide the piston in its return into the cylinder; the same operation continued, a constant motion is communicated."

It will be seen that here are the main points as to construction and working of the subsequent engines upon this cycle that afterward achieved success. The piston at the commencement of the cycle draws in a charge of air to mix with the vapor of the spirit previously injected for a portion of the stroke; flame is then drawn into the cylinder to ignite it, the piston is driven out by the resulting explosion, and during the return or in-stroke of the piston, the products of the combustion are displaced from the cylinder, when the cycle commences again.

It will be noted that this is the same process for vaporization, though in a much cruder form, than has been adopted at the present day in some oil engines upon the two-revolution or De Rochas cycle, viz., the dropping the fluid fuel upon a hot surface of metal within the cylinder to vaporize and ignite it.

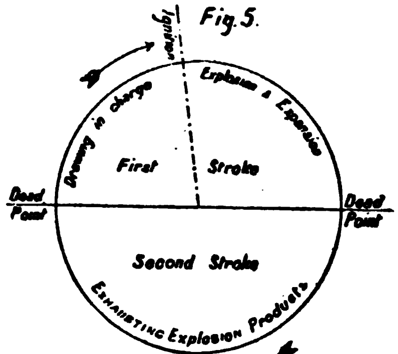
In 1860 the Lenoir engine was produced in France. On the 8th of February of the same year Lenoir took out a patent in this country, numbered 335, and entitled "Improvements in obtaining motive power and in the machinery or apparatus employed therein." The Lenoir engine was undoubtedly the first engine that was commercially a success; it sold in con-





siderable numbers. Fig. 3 is a sectional plan taken from the patent drawing; it very much resembles the steam engine of that time. *A* is the cylinder, *B* the piston; *G* is the admission slide, and *H* is the exhaust slide. ~~It is double-acting,~~ explosions taking place on both sides of the piston. Assuming that it commences to move from the positions shown, air is first drawn into the cylinder end A^1, and then air and gas are drawn through the slide *G*, the gas from the port *T* and gas-cock *R* to the same end A^1, the piston-rod end of the cylinder, through the port *C*. This admission of the working charge is continued for about one-half of the stroke, at which point the pressure in the cylinder is below the atmospheric, see Fig 4. The slide then closes the port or channel *C*, and the charge is ignited by an electric spark produced by a Rhumkorff coil at the igniter *J*. The explosion pressure rises to about 85 pounds per square inch; the piston is driven to the end of the stroke, at which point the pressure has fallen to about 7 pounds per square inch above atmosphere. The exhaust slide *H* then opens the port *D*, and on the return stroke the products of combustion are displaced from the cylinder up to the dead point of the return stroke, whereupon the cycle commences again. The eccentric G^1 works the slide *G*, and the eccentric H^1 on the other side of the engine works the exhaust slide *H*. *J* is the electric igniter at the other end of the cylinder. The same operations take place at the other end of the cylinder A^2. The indicator card, Fig. 4, is from a Lenoir engine. The diagram, Fig. 5, further explains this cycle.

Fig. 5.



Lenoir Cycle

We now come to Type 2 of Class 1. The earliest engine of this cycle is Samuel Brown's. There are two patents, the one No. 4,874, dated Dec. 4, 1823, and the second containing improvements upon the first, No. 5,350, April 25, 1826. Fig. 6 is taken from the earlier of the two patents. *AA* are the cylinders, *BB* the jackets open at the top between *A* and *B* to allow water to overflow into the working cylinder *A* from the jacket. *CC* are the pistons suspended by chains from the rocking beam *D*. *EE* are valves sliding upon the piston-rods, and suspended from the rocking beams by the chains *FF*, passing over wheels attached to the spiral spring *G*. *H* is the connecting rod transmitting the motion of the rocking beam to the crank-shaft *I* carrying the fly-wheel. *J* is a rod connected to the rocking beam *D*, transmitting motion to a second rocking beam *K* by means of the tappets *J* and *J*. The ends of the rocking beam *K* operate the slide valves *LL*, which open and close the ports *MM*. *N* is the gas reservoir or chamber supplying the nozzles *OO* inside the cylinder, and the pilot light burners *PP* outside the ports *MM*. The end of the rod *J* operates the pump *Q* in the water tank Q_1, which pumps water into the jackets. E^1 are small mushroom relief valves opening upward and outward fitted in the piston covers or valves *E*; there are two in each. Water stands in the cylinders to the level of the top of the pipes *RR*; any excess flows back into the tank Q_1 by these pipes. The slide N_1 in the chamber *N* controls the supply to the gas pipes feeding the nozzles *OO*, inside the cylinders. The burners *PP* remain alight during the running of the engine. The movement of the slide *N* is effected by the tube *S*, containing mercury to act as a governor; the tube *S* is oscillated on the center S_1 by the tappets *TT* on the rod *J*. As the action in both cylinders is alike, what follows applies to both equally. Assuming the piston to be at the top of the cylinder, as it is in the right-hand cylinder, we are considering the right-hand cylinder only—the burners *PP* are lighted, the fly-wheel is turned and the piston on the right of Fig. 6 descends; the tappet J_1 when the piston is nearly at the bottom, strikes the beam *K*, moves the slide *L*, opens the port *M*, and lights the gas at the nozzle *O* inside the cylinder; this continues to burn, the valve *E* being open. The piston ascends on the up-stroke, the combustion continues, and when the piston is near the top of the stroke the tappet J_2 strikes the beam *K*, which closes the valve *M*, and the pump *Q* causes the water to overflow from the jacket on to the ascending piston, and at the same time the piston-rod guide closes the valve *E* by stretching the spring *G*. The vacuum produced by the cooling of the products of combustion in the cylinder drives down the piston until the pressure within nearly equals the atmospheric, when the spring pulls up the valve *E* and the continued descent of the piston forces out the remaining products. The slide *L* again opens the port *M*, the rocking tube *S* again opens the slide N_1, and the cycle recommences.

Although Street was the first inventor and maker of a gas engine, yet this engine of S. Brown is the first gas engine, in spite of its complication, that was an industrial and continuous working mechanical success. A number were made and worked very successfully for many years; they were used chiefly for pumping, and propelling boats and barges. See *Mechanics' Magazine*, Vol. II., page 360 and 386, and Vol. IV., page 19 and 167.

Although I have placed Brown's engine as the first in Class 1, Type 2, its chief and leading idea being the working by the pressure of the atmosphere, owing to the vacuum created in the cylinder, yet a close examination of the construction of the engine shows that there was more or less continuous combustion during that art of the working stroke prior to the production of the vacuum, the flame burning from the jet or nozzle in the cylinder. It has not been placed under Class 3, Type 10, for the reason stated.

The best known and most successful engine of this class and type is that invented by Langen and Otto, the patent in this country being dated Feb. 12, 1866, and numbered 434. Fig. 7 illustrates this engine. It was excessively noisy, but it was economical; it consumed far less gas than any gas engine preceding it. It was, however, of a very similar construction to Barsanti & Matteucci's engine, which appeared in 1861; the cycle was precisely the same, but it had an advantage in having flame instead of electric ignition; they were both free piston engines. The Langen & Otto was commercially successful, while the Barsanti & Matteucci was not. The Langen & Otto is still occasionally to be found doing regular work even in this country. I know of one that does its daily

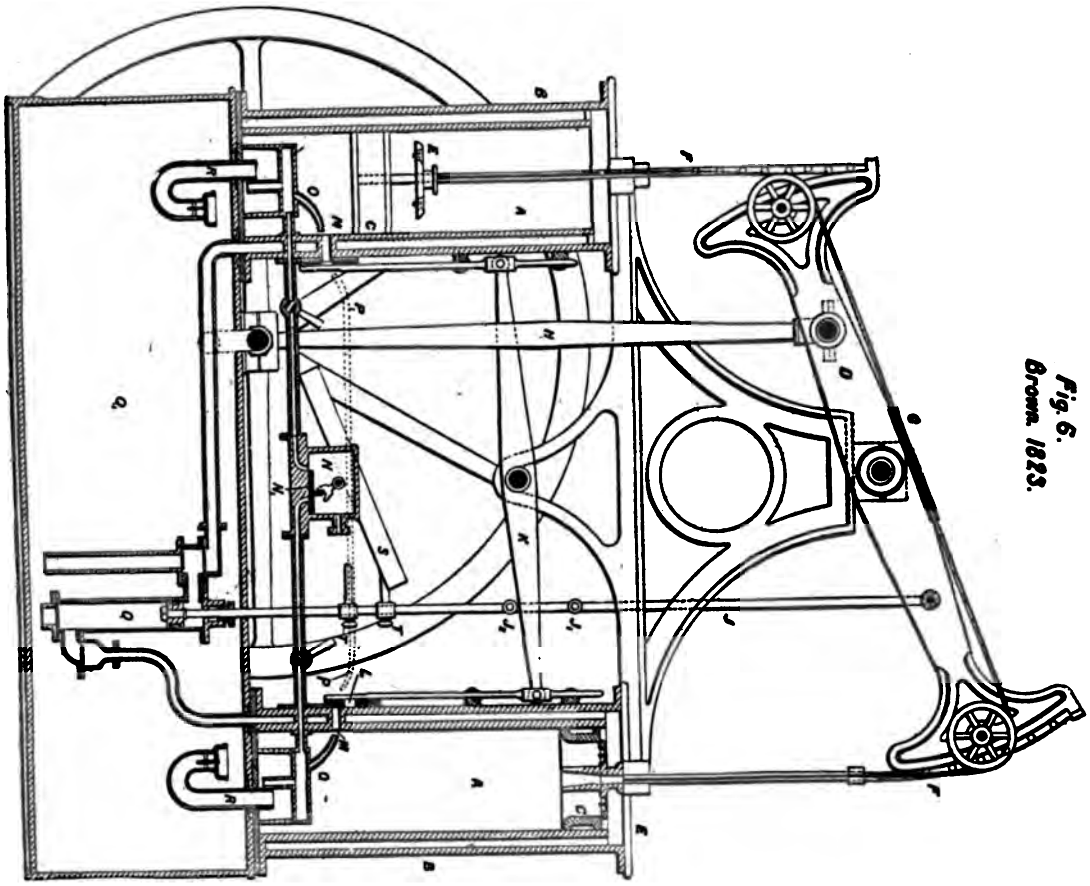
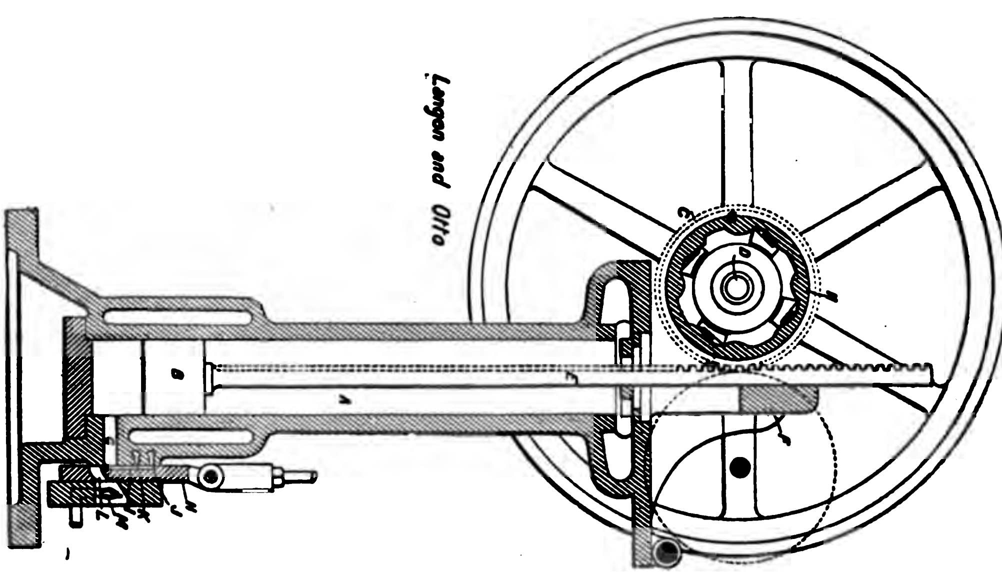


Fig. 6.
Brown. 1823.



Langen and Otto Fig.

work satisfactorily to its owner; and after many years of service the owner, when I last saw him, had no intention of replacing it by a compression engine in spite of its noisiness.

In the Langen & Otto engine the power of the explosion is not transmitted to the shaft. The pressure produced by the explosion throws upward in the cylinder a free piston, *i. e.*, a piston not connected to the shaft during the time in which the explosion is acting upon the piston. The piston having completed the upward stroke due to the explosion is then automatically clutch-eared to the shaft, and the power stroke is effected by the atmospheric pressure upon the piston during the larger part of the return or instroke.

The cycle is as follows: When the piston *B* is at the lowest position in the cylinder *A*, the fly-wheel is turned by hand, lifting the piston by means of the toothed wheel *C* on the shaft *D*, which gears into the rack *E* fixed to the piston. The rack moves in the guide *F*. The raising of the piston draws in a charge of gas and air through the port *G*, the slide *H* being moved to allow it. The port *I* in the slide permits communication between the port *G* and the air inlet port *J* and the gas supply *K*. The charging continues for about one-tenth the whole stroke of the piston; when the piston reaches the position shown the slide *H* opens the port *G* to the flame pocket *L* in the slide. The pocket is supplied with gas and air just before each ignition, and the mixture in the pocket is ignited by the burner flame *M*. The flame from the pocket is drawn into the port, *G*, ignites the charge in the cylinder, and the piston is thrown up by the explosion. A free upward movement is allowed to the rack *E* by the toothed wheel *C* as it is connected to the crank shaft by a clutch, having an equivalent action to that of a ratchet and pawl.

The quantity of charge drawn into the cylinder is adjusted to be only that amount necessary to throw the piston to the top of the cylinder; any excess force there may be is taken up by a rubber buffer provided to receive the blow.

A vacuum if formed in the cylinder by the prolonged expansion, and the pressure of the atmosphere on outside of the piston impels it on the return stroke, upon which the clutch *N* connects it to the fly-wheel shaft. The clutch *N* contains wooden rollers, which allow free movement in one direction but have a frictional grip in the other. The piston continues to descend, giving power until the pressure within the cylinder reaches that of the atmosphere again, when the momentum of the fly-wheel continues its movement to nearly the bottom of the cylinder, expelling the products. The fly-wheel momentum commences the upstroke of the piston, drawing in the new charge of gas and air, which is ignited, and the cycle is repeated.

The indicator card at Fig. 8, published by Mr. Crossley, for which I am indebted to Professor Robinson's book, "Gas and Petroleum Engines," shows clearly the action of this cycle. Fig. 9 shows the respective lengths of the processes of this cycle—not lengths of time, but of operations of this cycle.

Fig 8.

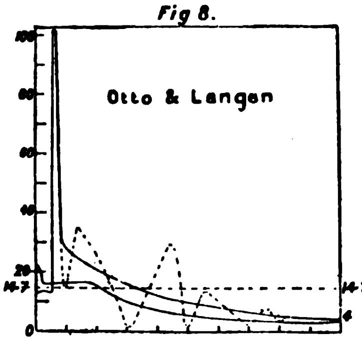
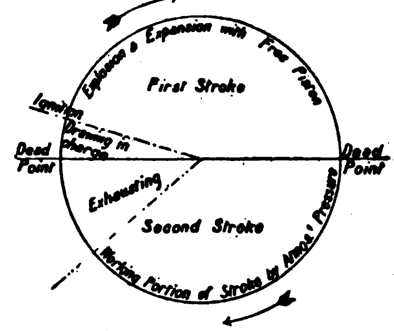


Fig. 9.



Langen and Otto.

With regard to Type 1 of this class—non-compression engines deriving their power from the explosion—I do not think that any economy, or indeed any improvement, is likely to be effected in the future once more to place it in the market as a competitor of compression engines. This cycle is, I believe, dead as far as motors are concerned; but it may possibly be used again for some special purpose, such as a gas hammer. Although, however, the atmospheric cycle is practically dead, I think it is quite within the range of possibility that a competitor of existing engines, on the ground of economy, but not on any ground—for such an engine will always be larger and heavier for its power than a compression engine—might be devised in the light of our present knowledge and of improvements effected in gas engine practice since engines of this type were designed.

Alcohol as a Fuel for Motors.

Experiments conducted in France to determine the relative merit of alcohol, kerosene and gasolene for power purposes, have produced the following results. Alcohol contains about half as many heat units as petroleum and evaporates less rapidly. In introducing alcohol into the motor therefore it was necessary to make a number of changes. The motor was started with petroleum and alcohol was substituted when the exhaust had reached a certain temperature; and the proportions of the mixture were modified, as twice as much alcohol as petroleum is required to produce an explosive mixture. Another method adopted was the use of a carbureter heated by gas and kept at a constant temperature, an expedient, however, which was found to be accompanied by considerable danger.

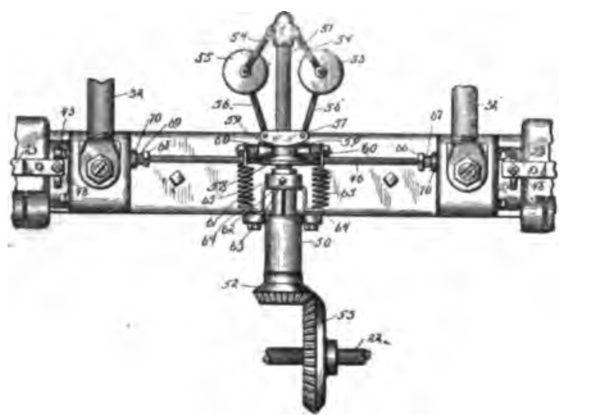
When economy of fuel was considered, alcohol was relegated to the rear, being over five times as expensive as kerosene for work done, and over three times as expensive as gasolene. When to this unfavorable showing is added the element of danger, we may dismiss alcohol as a fuel for motors.

We have had several letters from different parts of the States asking for information, and they have all mentioned seeing the photo in your paper. MOHLER & DE GRESS.

Mexico City, Mex.

589,583. *Governor for Gas Engines.*—Fred W. Spocke, Indianapolis, Ind. Filed April 7, 1896. Serial No. 586,570.

Claim.—In a governor for a double-acting gas-engine, the combination with the pair of gas-inlet valves, a lever pivoted to each of said valves, and means for independently opening each of said levers through the medium of its respective lever, of a governor-shaft mounted in suitable bearings and having



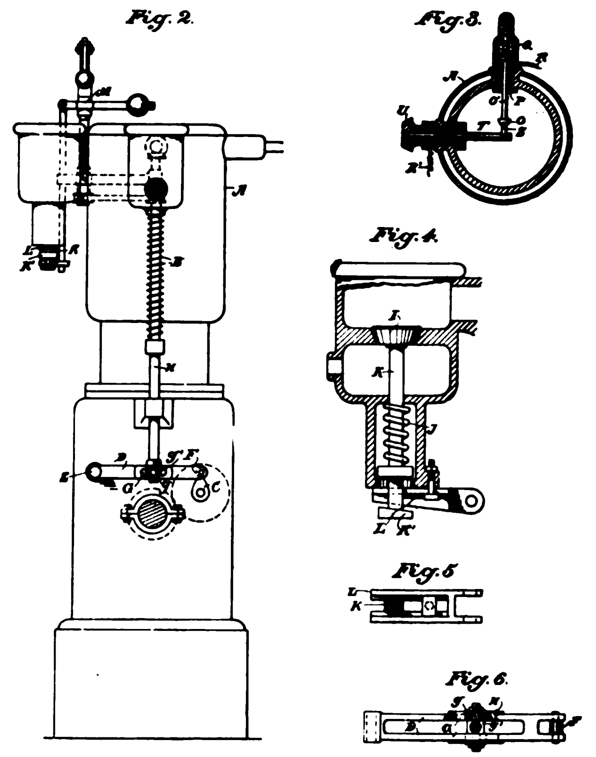
governor-balls secured thereto, a rock-shaft, intermediate connecting mechanism between said rock-shaft and the governor-balls whereby the movement of said governor-balls toward and from the governor-shaft will cause a rocking movement of said rock-shaft, and two arms carried by said rock-shaft and rotatively adjustable thereon, each of said arms being adopted to engage with one of the gas-valve levers, but each of said arms being capable of a movement independent of the gas-valve levers all combined and arranged to co-operate in such a manner that a movement of the governor-balls toward or from the governor-shaft will cause the said gas-valve levers to swing upon their pivots.

589,710. *Horseless Carriage.*—Paul Flucks, St. Louis, Mo., assignor of one-half to Gotthold Langer, same place. Filed Jan. 18, 1897. Serial No. 619,587.

Claim.—In a horseless carriage, a suitable reservoir, a spider at each end of the same, a tubular extension forming a part of the spider and communicating directly with the reservoir, a rotatable sleeve passed over said tubular extension, a series of arms radiating from the periphery of the sleeve, a series of arms forming a part of the spider and having passages leading to the tubular extension, each arm having one passage, a series of extension-arms for the aforesaid arms, each extension-arm having two passages, a valve located at the juncture of the passages of the extension-arms and the arms proper of the spider, a lever carried by each valve and adapted to co-operate with the arm of the sleeve adjacent thereto, means under the control of the operator for rocking the sleeve in either direction and thereby establish communication between the passage of each arm of the spider and either one of the passages of the extension-arm, the outer ends of the passages of the extension-arms being deflected in opposite directions, a wheel carried by each spider, a ring carried by each wheel concentric with the outer rim of the wheel and having a series of blades, the ejecting ends of the passages of the extension-arms being located along the inner circle of the blade-ring, whereby the fluid ejected through either passage of the extension will impinge against the blades of the ring, and cause the wheel to rotate in one direction or the other, the controlling devices for the sleeve on one side of the carriage being independent of those on the other side, whereby each wheel is under perfect control of the operator, substantially as set forth.

590,796. *Gas Engine.*—Arnold J. Tackle, Oakland, Cal. Filed April 15, 1897. Serial No. 632,286.

Claim.—In a gas-engine an igniting device consisting of a collar fitted to the side of the cylinder having a flanged inner end and a threaded outer end projecting beyond the exterior wall of said cylinder, an exterior housing, having internal threads by which it is directly secured to the projecting end of the collar, a stem slidable through the collar having an integral enlarged head of globular form, a spring in the housing and surrounding the stem, a second collar fitted to the side of the cylinder at right angles with the first-named collar, a

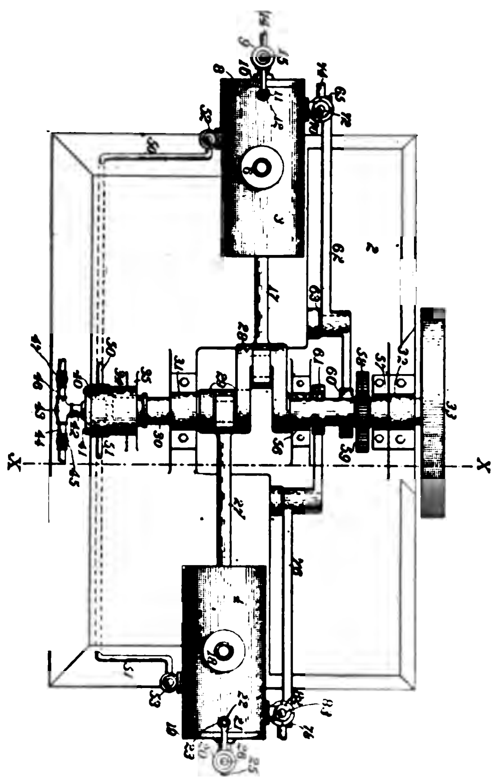


rotatable shaft mounted in said sleeve and intersecting the line of movement of the stem and having a flat wiping-plate rigid with it and adapted to contact with the curved surface of the globular head, whereby any wear on the end of the plate will tend to make it conform to the curved shape of the head to insure a perfect contact.

In a gas-engine having independent inlet and exhaust valves, springs by which the exhaust valves are normally closed, and means for actuating each of said valves comprising a longitudinally centrally slotted lever, fulcrumed at one end and extending transversely to the lower end of the valve-stem, a cam actuated from the engine-shaft and adapted to engage the free end of the lever so as to move the lever at suitable intervals, an antifriction-roller-bearing pin extending across the slot in the lever, said pin having a screw-threaded hole in the center, screw threads on the lower end of the valve-stem, fitting said pin whereby the latter is adjustably connected with the lever, and is prevented from transverse movement by the movements of the lever.

590,080. *Explosive Gas Engine.*—James S. Walsh, Providence, R. I. Filed Jan. 23, 1897. Serial No. 620,377.

Claim.—In an explosive-gas engine, the combination of a bed, cylinders secured to said bed and provided with inlet-ports, check-valves arranged to govern said inlet-ports, igniting devices, said cylinders having exhaust-ports, exhaust-valves arranged to govern said exhaust-ports, a revoluble crank-shaft, a revoluble cam-shaft, gearing connecting said shafts mechanism driven by said cam-shaft and constructed and placed to operate said exhaust-valves, a hollow rotary valve attached to said crank-shaft and having a circumferen-



tial slot, a suitably-supported casing possessing orifices and a stuffing-box, said casing having a cylindrical bore adapted to receive said rotary valve, devices for closing said casing and for delivering mixed gases aid a rotary valve interiorly, gas cocks and piping adapted to regulate the quantities of gases supplied to said rotary valve, and pipes connecting said check-valves and casing-orifices, substantially as described.

590,511. *Engine.*—Joseph Boyer, St. Louis, Mo. Filed Feb. 5, 1897. Serial No. 622,146.

590,640. *Carbureter.*—Daniel J. Byrne, Washington, D. C. Filed Jan. 2, 1897. Serial No. 617,745.

590,656. *Engine.*—Francis M. Comstock, Topeka, Kan., assignor to the Comstock Motor Co., same place. Filed April 6, 1896. Serial No. 586,276.

590,657. *Fluid-Pressure Engine.*—Francis M. Comstock, Topeka, Kan., assignor to the Comstock Motor Co., same place. Filed Jan. 4, 1897. Serial No. 617,910.

589,531. *Velocipede.*—Hermann G. Meumann, Bessemer, Ala. Filed Jan. 21, 1897. Serial No. 620,097.

590,883. *Rotary Engine.*—Oliver C. Fitts, Carpentersville, Ill. Filed April 26, 1897. Serial No. 633,958.

587,202. *Rotary Steam Engine.*—Lewis S. Hayes, Cortland, N. Y. Filed April 5, 1897. Serial No. 630,810.

587,747. *Igniters for Explosive Engines.*—Phillip Mueller, Decatur, Ill. Filed Dec. 18, 1896. Serial No. 616,133.

588,103. *Motor Vehicle.*—Charles E. Duryea, Peoria, Ill., and James F. Duryea, Springfield, Mass., assignors to the Duryea Motor Wagon Co., Springfield, Mass. Filed Nov. 7, 1896. Serial No. 611,335.

596,312. *Gas Engine.*—Charles Jacobson, Brooklyn, N. Y., assignor to the Climax Gas Engine Co., same place. Filed Sept. 24, 1895. Serial No. 563,569.

586,321. *Gas Engine.*—John D. Russ, Rahway, N. J., assignor by direct and mésue assignments, to Maxwell Wyeth & Co., Brooklyn, N. Y.

589,509. *Electrical Igniter for Gas Engines.*—Edward R. Moffitt, San Francisco, Cal. Filed Feb. 27, 1896. Serial No. 581,062.

AUSTRALASIAN PATENTS.

Messrs. Phillips Ormonde & Co, consulting engineers, patent and trade mark agents, 169 Queen Street, Melbourne, Victoria, Australia, supply us with the following specially prepared list of applications for letters patent in Australasia in connection with motor vehicles and the like:

C. K. Welch, of Park House, Coventry, Warwick, England, engineer, for "Improvements in Pneumatic Wheels."

F. J. Corbett, of 11 Portland Place, South Yarra, Victoria, for "Increasing Power and Speed in Mechanism."

A. Gross, of 156 Vickery's Chambers, 82 Pitt Street, Sydney, New South Wales, engineer, for "Improvements in or Relating to Automatic Action Pumps for Inflating Pneumatic Tires of Cycles and Other Vehicles."

D. Morgan, of 153 George Street, Launceston, Tasmania, Monumental Mason, for "Improvements in Wheels Principally Applicable for Bicycles and Other Road Vehicles."

C. A. Ingraham, of the Hamlet of Waligoon, District of Algoma, Province of Ontario, Canada, prospector, for "Improvements in Rotary Engines."

J. H. Henderson and J. Lamont both of High Street, Avoca, Victoria, for "Improvements in Driving Gear for Bicycles and the Like."

E. Coulson, of 116 A'Beckett Street, Melbourne, for "Improvements in Gas and Hydro-Carbon Engines."

A. Golding, of Balwyn Road, Canterbury, Victoria, for "An Improved Tire or Tire Cover for Cycles or Other Vehicles."

G. White, of 111 David Street, Brunswick, Victoria, for "Improvement in Rotary Impact Engines."

J. N. Carey, of 63 Melbourne Road, Williamstown near Melbourne, Victoria, for "Improved Variable Speed Driving Gear for Velocipedes, Autocars and the Like."

H. V. Hampton, of 55 Therry Street, Melbourne, for "Improvements in Hydro-Carbon Engines."

I wish your journal success and all that goes with it.

DR. A. N. CLARK.

South Norwalk, Conn.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Treatise on the Otto Cycle Gas Engine. By William Norris, M. I. M. E.
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Foreign........3.25

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A Text Book on Gas, Oil and Air Engines: or Internal Combustion Motors Without Boiler.—By Bryan Donkin, 8vo., cloth. New and revised edition just issued.
Price........$7.50

Gas, Gasolene and Oil Engines.—By Gardner D. Hiscox, M. E. Treating principally on American makes of these engines. Fully illustrated.
Price........$2.50
Foreign countries........2.75

IN PREPARATION.

Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

Pennington in Paris.

E. J. Pennington is now giving his attention to the Parisian public. He is breathing out challenges to all comers to meet him on a 2,000 mile course for a purse of £5,000. None of the French manufacturers took up the challenge because they did not feel warranted in risking so large a sum of their stockholders' money on a mere chance. A resident of Lyons, however, an amateur, accepted the challenge on condition that the distance be reduced to 600 miles. This Mr. Pennington will not accede to. Meanwhile Mr. Pennington is reported to have had a brush with the Count de Dion on one of the boulevards, and to have come out second best. It seems hardly probable that he will be more successful in securing a race in France than he was in England.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

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THE HORSELESS AGE

E. P. INGERSOLL, Editor.

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COMMUNICATIONS.—The Editor will b. pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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The Second Milestone.

This issue marks the close of our second year of publication. It has been a year of financial stringency in the United States, a year when old-established industries felt the pinch and when a new industry, such as we have undertaken to promote, must necessarily have suffered for want of capital.

Notwithstanding the adverse conditions, however, companies already in existence have been quietly at work improving their vehicles and their organizations, and new systems have been tested, which will doubtless result in the creation of other companies to share in the development of the industry.

Americans who have traveled abroad of late, have returned with a strong faith in the future of the motor vehicle, and a desire to see it adopted on this side of the Atlantic. These act as advocates and defenders of the new locomotion among our countrymen, and are eligible as investors or purchasers.

In all the principal countries of Europe most commendable progress has been made. Clubs for the promotion of the industry have been formed in Belgium, Holland, England, Germany and Italy. Capital is moving strongly motorward, and the pleasures of touring *à la chauffeur* are generally recognized. Everywhere the motor vehicle is appreciated and officially accredited.

To our readers, who have patiently followed us through all the delays and disappointments incidental to the inception of a new industry, we extend our thanks, and our congratulations at the perseverance and good judgment they have shown in standing true to the cause of what is destined to be the greatest industry of modern times.

The events of the year 1898 will convince the most skeptical. With the return of good times we shall soon be abreast of our foreign competitors.

The Investor's Opportunity.

Many American capitalists are reported loth to interest themselves in the motor industry because of the lack of basic patents on the self-propelled vehicle, assuming that without such protection the investment would not be a safe one. This is a gross error.

It may be true that no basic patents are obtainable in this line, but a number of valuable detail patents on motors and transmission mechanisms have already been taken out, and others will be brought to light by the experience of manufacture. The first market of the inventors who have improvements in motor vehicles to offer, will be the reputable manufacturers of such vehicles. Hence it is evident that the manufacturer who starts with a practical vehicle embodying a few good detail patents, sufficient capi-

tal to handle his business, and a fair amount of commercial experience, has all the chances in his favor. He is building up a reputation and perfecting his organization daily, and, if he cannot make his own business grow with the general growth of the industry, it is his own fault. The one fact to be kept ever in view by the hesitating capitalist is the extraordinary and world-wide demand for these vehicles. Conjoined with this is the fact that, though we have no "perfect motors" (nor perfection of any other kind), we have in some of our present vehicles very serviceable machines, so far ahead of the horse in economy and other respects, that they are eminently worthy of the attention of investors.

"There is a tide in the affairs of men which, taken at the flood, leads on to fortune."

Gasolene vs. Gas Engines.

According to reliable authorities the gasolene engine is beginning to displace the gas engine in the United States. The reason for this is seen in the comparative prices of the two fuels. Gas can safely be computed at $1.25 per thousand feet, while a thousand feet of gas can be produced from gasolene for about 80 cents. The economy of the gasolene engine is therefore almost twice as great as the gas engine under ordinary circumstances. Where producer gas can be used the figures would be changed considerably, favoring the gas engine in most cases.

The consumption of gas for power purposes could be enormously increased, if the gas companies would make a satisfactory rate to such consumers, but as they show no inclination to do this, the gasolene engine is filling the breach.

French Motor Shares.

American capitalists who are seeking proof of the profitableness of investment in the motor vehicle industry, should investigate the French companies, already organized or organizing. In almost every instance the shares are quoted at a premium, sometimes even before the concern is fairly in operation. The oldest and largest company is a year and a half behind in orders, and on all sides facilities are being increased as rapidly as possible. Popular interest meanwhile continues unabated.

In contrast with the speculative balloon which was raised in England, and which courts, promoters and shareholders are now trying to drag back to solid earth, the French method is most commendable. These companies are capitalized on a fair working basis, so that liberal dividends can be earned, and more capital readily obtained as required.

The solid development of the French industry will undoubtedly be repeated in the history of the industry in this country. A substantial groundwork is already laid, and the superstructure can now be reared with confidence. Open sesame.

The articles on the "Cycles of Gas and Oil Engines," by J. D. Roots, which appeared in the last two issues, will be continued in the forthcoming numbers. Mr. Roots is one of the authorities on this subject in England, and as he is also a manufacturer of vehicle motors, the series is particularly valuable to students and workers in this line. It is claimed that he is the only inventor who, up to the present time, has succeeded in producing a practical kerosene motor for vehicles. Our readers will remember these vehicles by the peculiar name "petrocar," adopted for them by the manufacturers.

The Struss Motor Carriage.

In this issue we illustrate a motor carriage built by Henry W. Struss, of New York City. The carriage work was done by Burr & Co., but the mechanical part was put together in Mr. Struss' own factory, in East Forty-second St., the motor having been designed and built by himself.

The motor is a four cylinder gasolene engine of the Otto type, with electric ignition by induction coil. To secure lightness, combined with strength, the cylinders, 3 x 3½, are made of steel tubing inserted in bronze castings, containing the water jackets and crank case. The jackets are divided into two parts, the rear being for the cooling water, and the forward for heating air, which is drawn through the vaporizer.

All the valves are positively opened by cams.

The main bearings of the motor as well as those of the cam shafts are regular adjustable cone and cup ball bearings.

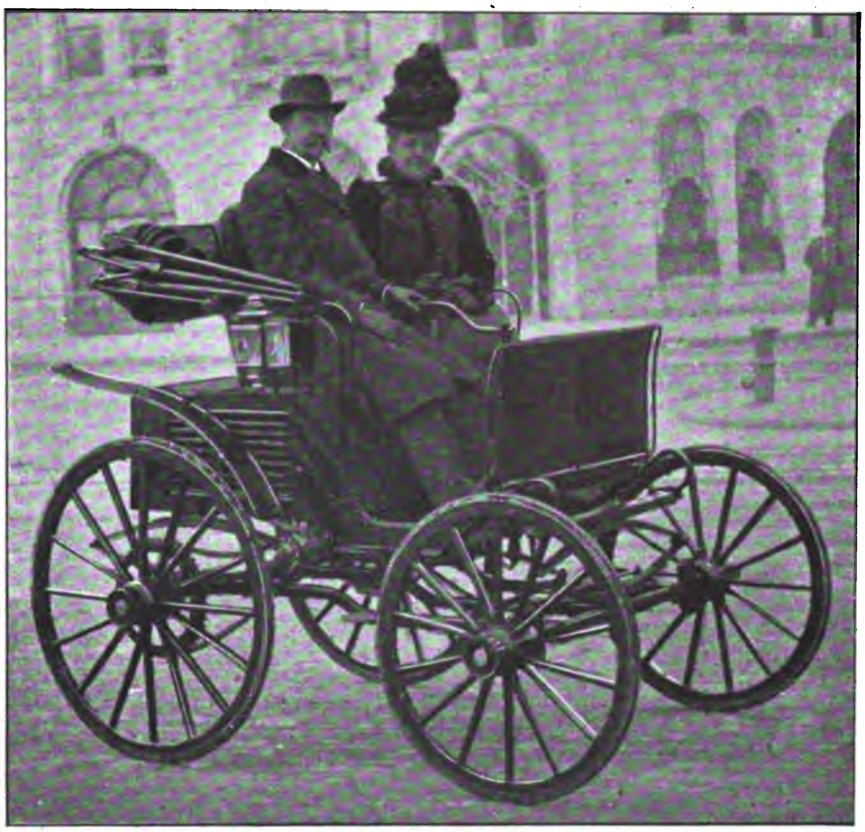
Roller bearings are used on the countershafts.

The transmission of power is by belt to one countershaft, from which it is carried to another through gearing and from this to the wheels by chains.

The pulley on the countershaft is arranged to drive same in either direction.

There are three changes of speed effected by change of gearing; nominally three, five and ten miles per hour, with the motor running at about two-thirds or normal speed under a load. The speed of the motor can be regulated from the seat, and there is no governor.

There is a separate lever each for steering, starting, changing the gearing for speed, reversing (by foot) and brake.



GASOLENE MOTOR CARRIAGE, H. W. STRUSS, NEW YORK.

The band brake is on the countershaft carrying the sprocket wheels.

The weight of the motor, including the 70-pound fly-wheel, is less than 240 pounds. No power tests have been made, but from the dimensions, Mr. Struss presumes the motor would be nominally rated as four horse power.

The inventor has made no trials to determine how heavy a grade could be mounted with the lowest speed gearing, but although the carriage is rather heavy for the motor, he has no trouble in running an average of over seven miles an hour on the ordinary grades in the city on medium speed, or ten to twelve miles on a level or up slight elevations with the fast speed gearing.

Conclusions formed so far are: That the motor is powerful enough to be run only at half speed or power, and thus leave a large reserve for mounting hills or increasing speed above the legal limit; that while not necessary, a governor has advantages; that only two changes of speed gearing would be necessary with a controllable speed of motor having reserve power; that there is no special advantage in having different functions combined in the same lever, provided all are properly arranged for the control of the vehicle; that four cylinders give comparatively little vibration and noise as compared with one or two of same total power, although extra valves and parts increase the cost and care to some extent; that motor carriages can be built that are both useful and ornamental.

I find your paper a very valuable help, and wish you entire success.

Brookline, Mass. EDWARD C. NEWCOMB.

Compressed Air Vehicles of the Pneumatic Carriage Company.

Some two years ago the Pneumatic Carriage Company was organized under the laws of West Virginia, with an authorized capital of $500,000, and with offices at 253 Broadway, New York. The organizers had been conducting experiments with compressed air motors for street railway service for several years, and naturally turned toward the motor vehicle when it received its first impetus in America.

The president and manager of the company is A. H. Hoadley, who has been in charge of the experiments at the works of the American Wheelock Engine Company, Worcester, Mass.

The first carriage built by the company, illustrated herewith, was completed in November, 1896. It has seating accommodations for six passengers, weighs 2,700 pounds, and will run 20 miles over ordinary good roads on one charge. A grade of 20 per cent is claimed to be surmountable.

The wooden wheels are 30 and 42 inches respectively, and pneumatics of 4 inches diameter render riding as easy as possible.

The storage reservoirs have a capacity of 13 cubic feet of compressed air at 2,000 pounds pressure and have a factor of safety of 6½ to 1, the bursting pressure being 13,000 pounds to the square inch. They are made of nickel steel and weigh 66 pounds to the cubic foot capacity.

The air is conducted to the motor by a pressure reducing

COMPRESSED AIR CARRIAGE. PNEUMATIC CARRIAGE CO., NEW YORK.

valve of new design, which gives a constant pressure on the motor of 100 pounds to the square inch.

The motor, of the reciprocating type, weighs 400 pounds and operates at 350 revolutions, when the carriage is making 15 miles an hour.

Ordinary compensating gear and hub steering are employed. In order to heat and expand the air before it enters the motor, it is surcharged with hot water, carried in the vehicle in a separate tank and kept at a temperature of 400 degrees Fahrenheit. Five pounds of water are required for each mile traversed. All the above machinery is spring-supported, to relieve it from the shocks of the road.

This carriage has been tested for the past year or more in the streets of Worcester and Washington, D. C.

The Pneumatic Carriage Company have also just completed a tractor capable of drawing a 10-ton truck 30 miles on good city roads. This tractor weighs 8,000 pounds, carries 50 cubic feet of reservoirs, and 500 pounds of water. The motor weighs 1,600 pounds, and is said to be capable of hauling 10 tons up a 5 per cent grade at the rate of 4 miles an hour.

The changes in the system employed in the truck are that the motor is compounded, and instead of an initial cylinder pressure of 100 pounds to the square inch, we have 200 pounds.

An omnibus to weigh 9,000 pounds and carry 26 passengers is also being built for a foreign order. It is designed to go 20 miles on one charge, and to be entirely free from noise, vibration or odor.

Riker Two-Passenger Trap.

This very neat looking vehicle is the latest product of the Riker Electric Motor Company. It weighs 1,800 pounds, and in its mechanical and electrical details is the same as the victoria described in our last issue.

The Lister Motor.

This motor of the Otto type, runs with either gas or petroleum. The cylinder *b* has two pistons *c* and *c*[1], moving simultaneously in opposite directions and joined by levers and connecting rods *dd*[1], *ee*[1] and *ff*[1] upon the shaft *gg* carrying the fly-wheel *h*. The valves *k* regulating the admission of air and oil are operated by the cam *n*.

When gas is used the admission of air and gas takes place simultaneously or successively as desired. When petroleum

TWO-PASSENGER TRAP, RIKER ELECTRIC MOTOR CO., BROOKLYN, N. Y.

Diesel Oil Engine.

(Continued from page 13, September issue.)

Distillation with an Engler apparatus showed that 15 per cent. distilled off at 150 deg., Cent., 25 per cent. at 300 deg., Cent., and from 8 per cent. to 11 per cent. at intermediate temperatures. From the large percentage of oil distilling at high temperatures, it appeared to be American petroleum. The heating value was determined twice, with a Junker and a Bomb calorimeter. The mean heating value with the former was 18,241 B.T.U. per pound, and with the Mahler as used to check it 18,498 B.T.U. per pound; mean of the two 18,370 B. T.U. per pound. Hence the heat balance of the engine during the two full power trials works out as follows:

HEAT BALANCE (FULL POWER TRIALS).

	I	II.
% heat turned into indicated work	33.7 %	34.7%
" " lo-t to cooling water	39.0"	40.3 %
" " dissipated in other ways	27.3"	25.0 "
Total	100.0	100.0
% actual heat turned into work on the brake	25.2%	28.2%

The greater number of revolutions in the first trial was clearly the reason of the lower efficiency. Taking the mean of the four trials, at half and full power, we get:

Full Power	Heat turned into indicated work in both trials	34.2%
	Heat turned into actual work on the brake in both trials	25.7"
Half Power	Heat turned into indicated work in both trials	38.5"
	Heat turned into actual work on the brake in both trials	22.4"

Analysis of Exhaust Gases.—An additional interest in the trials was the analysis of the exhaust gases. A short metal tube was inserted in the exhaust pipe, exposed to the full stream of the gases, and a portion drawn off. The gases were sampled continuously in a vessel under water, to prevent leakage of air in, and were then tested by passing them in a continuous stream through a bottle half filled with water. No petroleum was detected, and there was nothing beyond a slight smell, showing that combustion was very complete. The exhaust gases were then sampled in the ordinary way, by absorption through a burette and pipettes. At full load the mean composition was 9.96 CO^3, 4.70 O, 0.20 CO, 85.4 N per cent. At half power there were no traces of CO, and the gases were practically invisible and without smell.

From this analysis the percentage ot excess of air can be deduced in the usual way; Professor Schroter calculates it from the excess of N, according to the following formula:

$$\text{Excess of air} = \frac{N}{N-\frac{79}{21}} O = \text{mean excess of air (at full power) 26 per cent.}$$

mean excess of air (at half power) 160 per cent.

The theoretical quantity required for petroleum of the above chemical composition is calculated from the following formula:

$$\text{Air required} = \left(\frac{8}{3}C + 8\,H - O\right)\frac{100}{23} = 14.78 \text{ pound air per}$$

pound petroleum or 3.40 pound O and 11.38 pound N. Assuming combustion to be complete the admission of this theoretical quantity of air would give, by combination of the proportion of O with the C and the H, 3.12 pound CO_2, and 1.27 pound HH_2O. The actual composition of the exhaust gases by weight was 15.9 per cent. CO_2, 6.5 per cent. H_2O, 4.5 per cent. O, and 73.1 per cent. N at full power. The mean specific heat of the gases at ordinary temperature was 0.26; percentage of heat not accounted for 0.73 per cent.

Professor Schrcter is of opinion that the Diesel oil motor is distinguished by two peculiarities—the large percentage of heat given to the engine and transformed into work, and the increase of this percentage as the power diminishes. The trials show conclusively the "slight increase in consumption per brake horse-power in the transition from full to half power." With varying loads it is important to observe that the thermal efficiency increases with lesser power, and thus the economic or actual efficiency, that is, the proportion of heat turned into useful work, only fluctuates from 22 per cent. to 26 per cent. In this respect the engine compares favorably with other four-cycle gas or petroleum motors, in which both efficiencies, the thermal and the economic, and therefore the consumption, increase with smaller load. The working process is quite different from that of other explosion engines, and more resembles that of a steam engine, as shown by the indicator diagrams taken while the engine was passing from full load to empty. Thus the new motor shares with the steam engine the quality of elasticity, the performance being easily adjusted to the power required. In conclusion, Professor Schrcter fully endorses what had previously been said with reference to the economy and efficiency of the new engine.

The following table summarizes the chief results of the four trials; date February, 1897:

TRIALS OF A DIESEL OIL ENGINE AT AUGSBURG.

Nominal horse-power	20
Diameter of motor piston	9.8 in.
Stroke of motor piston	15.7 in.
Stroke of air pump	7.8 in.
Diameter of air pump	2.7 in.

Mean heating value of oil, 18,370 B. T. U. per pound.

	Full Power		Half Power	
	I.	II.	III.	IV.
Number of revolutions	171.8	154.2	154.1	158.0
Metric Indicated horse-power (motor cylinder only)	27.85	24.77	17.71	17.72
Metric Brake horse-power (motor cylinder only)	19.87	17.82	9.58	9.84
Mechanical efficiency %	74.8	75.5	57.8	59.6
Consumption of oil per indicated horse-power hour . . . lb.	0.40	0.39	0.16	0.16
Consumption of oil per brake horse-power hour . . . lb.	0.54	0.52	0.61	0.60
Temperature of exhaust gases	404° C.	378° C.	260° C.	260° C.

Duration of each trial one hour.

Since the paper appeared in the *Zeitschrift des Vercines*, another series of tests have been made by Professor Sauvage, of Paris, at Augsburg, in April, 1897, on the same engine, with water circulating in the pistcn. The results were practically identical with those of Professor Schrcter. In two full power trials the heat turned into work on the brake was 25.6 per cent. and 23 per cent. respectively, and the consumption of oil per brake horse-power hour 0.53 pound and 0.59 pound. The mechanical efficiency varied from 74 per cent. to 78 per cent. The heating value of the oil was 18,360 B. T. U. per pound.

A writer in a recent number of *La Locomotion Automobile* argues against acetylene as a motor fuel, on the ground that at present prices in France it would cost twice as much as petroleum, could not be readily obtained, and would have to be stored in the vehicle under pressure or made en route by dissolving carbide of calcium in water. If the gas is produced direct, six times the weight of material (carbide of calcium, water, etc.) would be required to produce it—more than is needed when petroleum is used. If carried under pressure we have the danger, the weight of the receiver, the price and the difficulty of renewal to contend with.

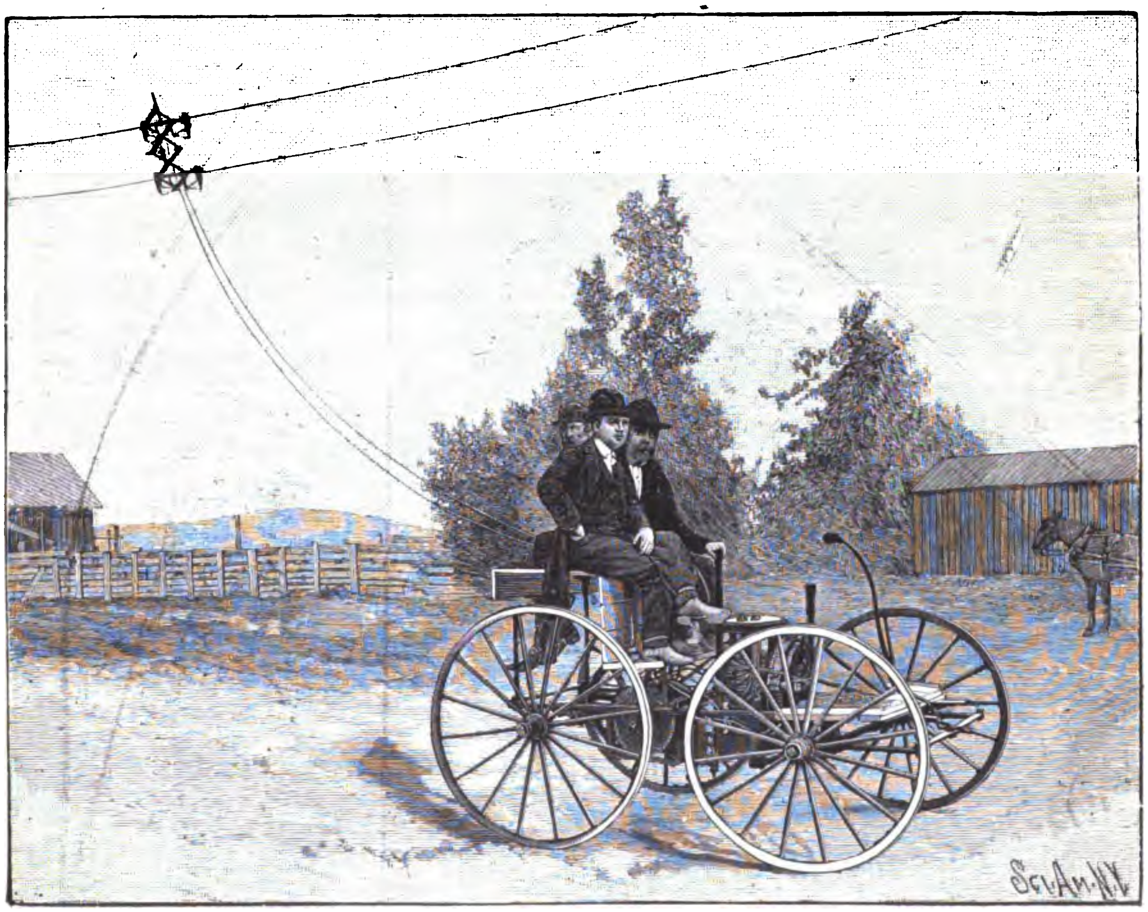
The Trolley Road Wagon.

W. G. Caffrey, of Reno, Nev., has been carrying on experiments for several years to develop a trolley road wagon which could be successfully used in outlying districts where water power is available for the generation of electricity. The accompanying cuts, for which we are indebted to the *Scientific American*, show the result of Mr. Caffrey's experiments in actual operation near his foundry at Reno.

A line of ordinary poles was set up and the dynamo placed therein. The two wires were secured to the poles about 18 inches apart and 17 feet from the ground, and a trolley with a lazy tongs arrangement allowed the current to be furnished to the wagon. The problem which the inventor had to solve was a difficult one, as a perfect circuit must be maintained at all times and the contact must be flexible enough to allow a wide divergence from the regular road if necessary.

The improved form of trolley works admirably. It consists of a metallic frame having two over-running wheels, and underneath these are the two locking wheels, which effectually prevent the top wheels from leaving the wire and still allow the frame to pass the support, holding the wire on the pole. On the lower wire a similar device is used. The two trolleys are connected by an insulated pantograph or lazy tongs equipped with suitable guides, thus providing for unequal tension on the trolley wires. The poles are 24 feet long and 6 inches in diameter at the small end. They are placed at intervals, of 125 feet. On the inner or road side of these poles are two supports or "pass-bys" of malleable iron. No. 0 bimetallic wires are used. The current is supplied to the wagons by cable which runs on an automatic reel on the wagon, permitting the cable to run out 200 feet if necessary, or wind up to a short length, thus allowing the wagon to follow the ordinary road and permitting it to turn or do anything required of it. The ordinary trolley pole may also be used, but the cable permits of running the wagon on either side of the ordinary road, allowing it to meet or pass vehicles without difficulty.

The four-wheeled wagon shown in our engraving has wheels 48 inches in diameter. The rear wheels are fastened to a shaft geared to a spring-suspended motor. The motor is a two horse-power one of the Westinghouse crane type. In front of the motor a commutator controller is suspended, the handle of which is within easy reach of the person steering the wagon. The front axle is trussed and the spindles are pivoted to the wheel hub, with an arm extending forward about 18 inches, fastened rigidly to the spindle. These two arms are connected, and the connecting bar again connected to the steering bar. This gives quick-turning qualities with easy



A TROLLEY WAGON FOR COUNTRY ROADS.

manipulation. The generator used was a five horse-power compound wound Westinghouse 500-volt dynamo. It is said that on the trial trip a speed of fifteen miles an hour was reached with a load of 2,500 pounds on the wheels. The control of both the motor and the steering apparatus was all that was desired. The trolley moved easily over the wires and there was no difficulty with the "pass-bys."

The development of the long-distance power transmission and the utilization of this or some similar system in favorable localities will prove of great value to the farmer and those who have occasion to transport goods along country roads.

I commenced with your journal in the beginning, and I shall continue as long as you deserve it. I therefore enclose check for $2 for another year. I must say THE HORSELESS AGE is edited with great ability. You stick to the cause and in your editorials use reason and common sense. A. B. HARING.

Frenchtown, N. J.

Acetylene Motor of Turr & Chertemps.

Since the discovery of Wilson's method of producing calcium carbide many experiments have been made with its product, acetylene, looking to its application for power purposes, particularly in light motors. These experiments have been chiefly confined to Europe, and one of the most recent, reported in a late number of *La Locomotion Automobile*, is the acetylene motor of Turr & Chertemps, in which the force of the explosion may be utilized to change a quantity of water into steam, and thus obtain a gradual pressure upon the piston, by using the expansion of the steam to the end of the stroke. Owing to a peculiarity of construction, the piston presents to the action of the gases a greater surface as it moves away from its point of departure. The description of a single piston motor is appended. Fig. 1 shows the side elevation; Figs. 2, 3 and 4 show the arrangement of two cylinders, so

FRONT VIEW OF TROLLEY WAGON.

related that the valve and pumps of both cylinders are controlled by one connecting rod.

The motor consists of a cylinder *B*, closed at one end, and a piston *K*.

D is a chamber where occurs the explosion of the mixture of gas and air forced by the pump, *H*, into the pipe *F*. Ignition may be effected by the electric spark or the hot tube.

The cylinder wall is bored out in three steps or compartments, so that the distances from one step to the other increase. The cylinder has a water jacket into which water is forced by a pump through a pipe.

The pump, *H*, forces the acetylene through the conduit, *I*, the air through the pipe, and drives the mixture through the canal, *F*, into the chamber, *D*. The burnt gases are expelled through the passages 1, 2, 3 into 4, whence they escape through the valve, *V*. This valve is mounted on the shaft *X*.

The piston conforms to the interior of the cylinder, that is to say, is itself stepped, and when it occupies the position indicated in Fig. 1, small space remains between the surfaces *b*, *b'* and *c*, *c'*.

The tube *t*, which conducts the water from *c*, carries it into the reservoir, ending in a valve, *s*, open at the moment the water comes but closed when the piston, *M*, is driven back by the pressure of gas upon the face opposite to that in contact with the water, the walls of which are curved to guide the course of the piston, *M*. This is operated by a rod moving in a chamber *N*, hollowed out of the center of the piston, which therefore contains a small piston. When the piston, *M*, is driven back, water is injected into the chamber, *D*, through the capillary tubes, *a*, *a'*. The connecting rod, *P*, is atttached at the other end.

Let us suppose the piston is at the first dead point. Then the spark is produced between *o* and *o'* and the mixture in *D* is ignited. The expanding gas presses the piston back, causing the water to gush out through the openings *a* and *a'*.

Inasmuch as the explosion raises the temperature in *D* sufficiently to vaporize all the water passing out through *a* and *a'*, the piston is forced back. The steam acts upon the piston, and as this piston moves forward, encounters a larger surface in the second compartment of the cylinder, over which it expands. Thus the water in the chamber, which is ejected through the passages *a* and *a'*, receives the first shock of the explosion, acting as a cushion or deadener.

A very small quantity of gas is sufficient, as the explosion produces steam which does the work of gas.

When the piston returns to its first position the burnt gas and steam escape through 1, 2, 3, 4, while the pump, *H*, admits a new mixture to *D*.

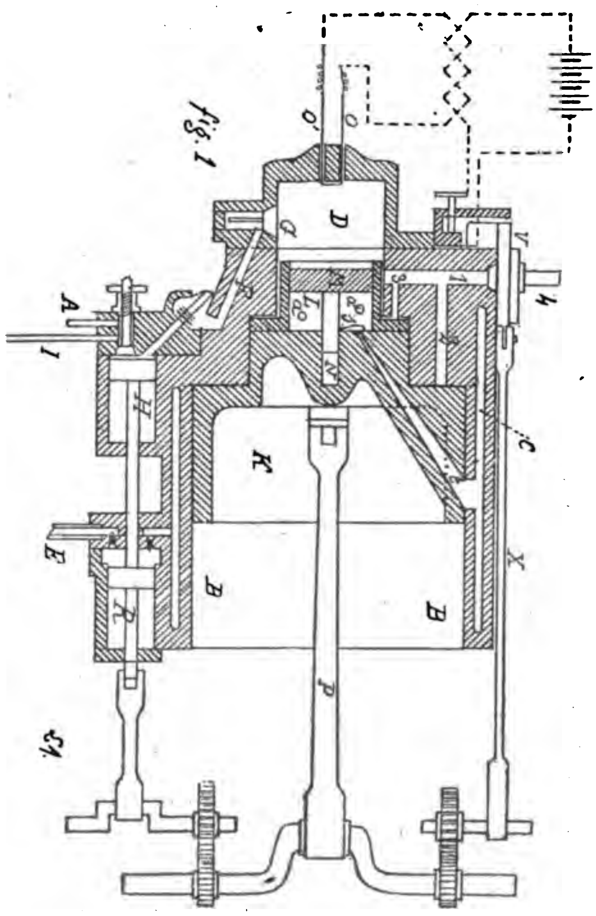


fig. 2

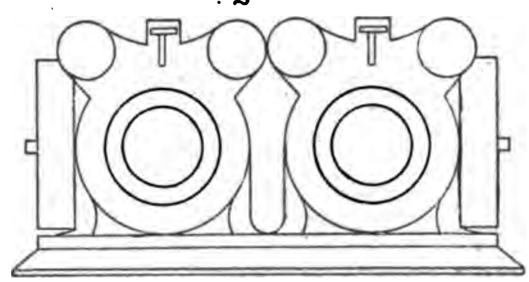


fig. 3

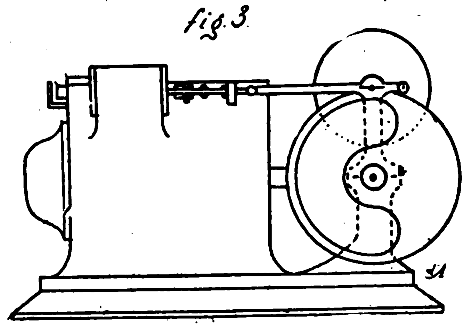
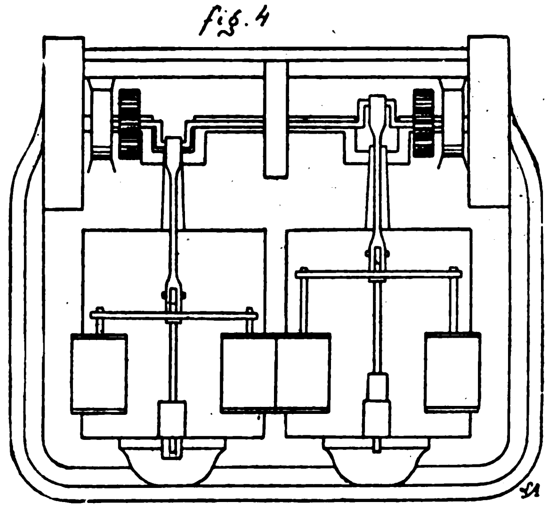


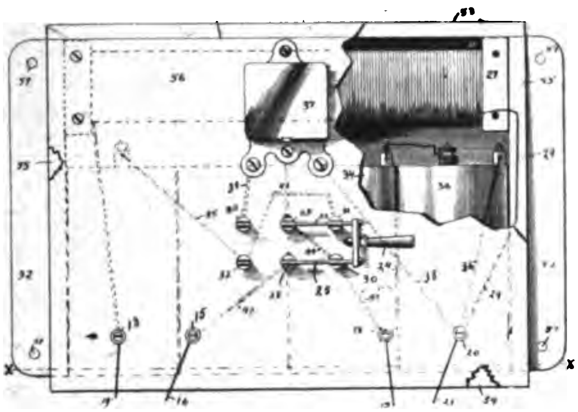
fig. 4



Recent Gas Engine and Motor Vehicle Patents

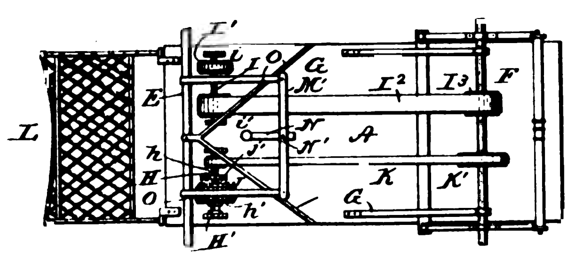
591,123.—*Igniting Means for Explosive Engines.*—Vincent G. Apple, Miamisburg, Ohio. Filed April 23, 1897. Serial No. 633,234.

Claim.—The combination with a cabinet, of a battery and coil arranged within said cabinet, binding-posts 13, 15, 18 and 20 and switch-posts 22, 23, 30, 31, 32 and 33 mounted upon and projecting from said cabinet; an electrical alarm mounted upon said cabinet; an electrical connection within said cabinet and between said alarm posts 20 and 33; an electrical



connection within said cabinet and connecting said coil to posts 13 and 20; electrical connections within said cabinet and between posts 15 and 22, between posts 18, 30 and 23, between posts 31 and 32, and between the respective poles of said battery and the posts 32 and 20; switch-blades 25 and 26 pivoted respectively to posts 22 and 23; a handle 24 secured to said switch-blades; said switch-blades being adapted to simultaneously engage the posts 30 and 31, or the posts 32 and 33; an explosive-engine having successively-contacting points therein; an electrical connection between said contact-points and the posts 13 and 15; a dynamo driven by said explosive-engine and electrically connected to posts 1 and 20, substantially as specified.

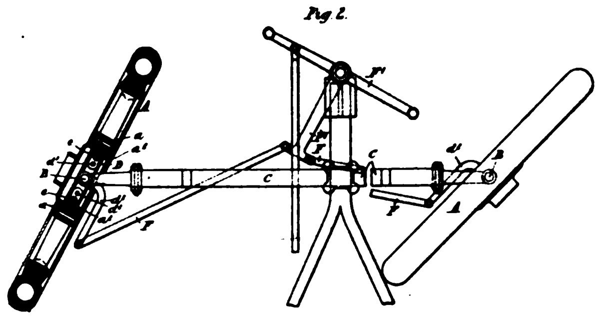
591,398.—*Motor Vehicle.*—George H. Grenlich, Cincinnati, Ohio. Filed Aug. 14, 1896. Serial No. 602,789.



Claim.—The combination with the vertical rod and the handle, of the curved arm carried by the handle, the slide, the pivoted catches arranged to be actuated by said slide and the curved notched bar, all susbtantially as specified.

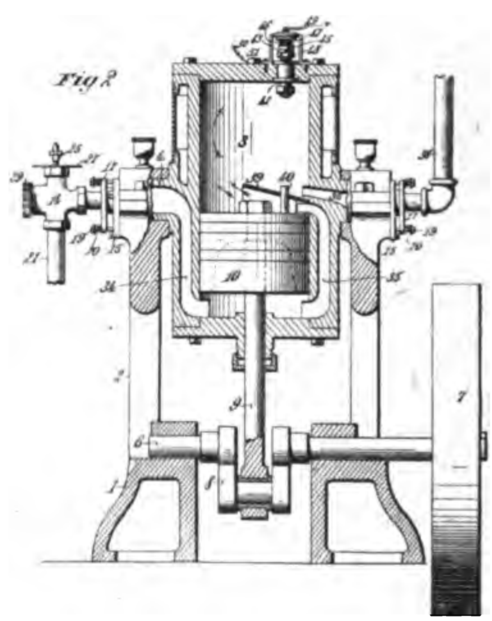
591,595.—*Steering Mechanism for Motor Vehicles*—Camille A. Faure, Paris, France. Filed Jan. 18, 1897. Serial No. 619,661. Patented in Belgium, May 4, 1895. No. 115,425, and in France, Nov. 4, 1895. No. 251,431.

Claim.—The combination with a wheel and an axle there-



for, of a disk pivoted to the axle in the plane of the wheel and located within the hub of the latter, ball-bearings located in corresponding grooves in the periphery of the disk and the interior of the hub, an adjustable ring which forms in part one of said grooves, and means for turning the disk on its pivot, substantially as described.

591,952.—*Explosive Engine.*—Charles I. Cummings and John C. Hilton, Erie, Pa. Filed Dec. 10, 1896. Serial No. 616,274.

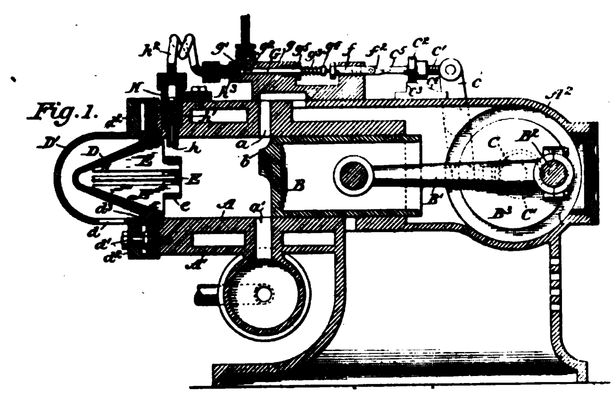


Claim.—In a gas-engine, the combination with the cylinder thereof, of a valve-casing 14 connected with a gas-supply pipe and with the cylinder, a valve 22 for controlling the passage of the gas through said cylinder, and an air-valve for periodically admitting air to the valve-casing, said air-valve consisting of a centrally-apertured cap 29 fitted over the nipple 28 and provided with inwardly-projecting guide-fingers 30, a reciprocating valve 31 arranged between said fingers and adapted to set against the cap 29 over the central aperture, and coiled spring 33 disposed between the valve 31 and fixed support on the interior of the valve-casing and operating to normally hold the valve closed, substantially as described.

592,033.—*Explosive Engine.*—Carl W. Weiss, New York, N. Y. Filed June 12, 1896. Serial No. 595,252.

592,034.—*Explosive Engine.*—Carl W. Weiss, New York, N. Y. Filed Dec. 17, 1896. Serial No. 615,975.

For the purpose of increasing the vaporization-surface within the explosion-chamber and of maintaining the temperature therein at such a degree that the engine will be self-igniting



after it has been started. I prefer to support within the conical shell D a number of plates or ribs E E, which may be cast in one piece with a connecting-ring *e*. In order that the dead gases may be cleared out of the igniter and explosion-chamber thoroughly after each explosion, the plates E E, as clearly shown, do not meet in the center, but are disposed about an open space, and a ring *e* is employed to secure them together in place of a plate, whereby as the current of air enters from the port *a* and is deflected by the deflector *b* into one side of the explosion-chamber, carrying with it the oil-spray from the extremity of the oil-duct, it drives out before it from the other side of the explosion-chamber and igniter, between the plates E E, all of the dead gases that may be therein. It is obvious that these plates might be cast with the shell, D but I prefer to form them separately in order to retard the conduction of heat from said plates to said shell. It will be understood, of course, that the said plates E E remain at a red heat during the operation of the engine, and that as the charge of the explosive mixture is compressed in the explosion-chamber by the return of the piston, the temperature is raised sufficiently to effect the ignition of the charge.

In accordance with my invention the oil to be vaporized is itself brought directly into the cylinder or into the explosion chamber and is there converted into vapor and the vapor mixed with the proper volume of air. To this end the oil is preferably fed through a nipple H, which projects through the jacketed portion of the wall of the cylinder just in front of the shell D and in the path of the current of air as it enters from the compressor. The oil, which is fed by suitable means and stands in a small drop upon the end of the nipple, is caught by the blast of air and is blown in the form of a spray into the explosion-chamber D and against the heated surfaces, and is immediately converted into vapor. The air which blows the oil from the nipple and converts it into spray at the same time supplies the volume of air necessary for the formation of the explosive mixture. The entire quantity of oil supplied at the end of the nipple H is blown off, so that none remains to be carbonized on the nipple, and there is no opportunity for the spray or vapor to be condensed before the explosive mixture is formed. Furthermore, there are no ducts or channels leading out of the cylinder to receive the vapor and to retard the ignition thereof, so that the combustion of the entire charge is complete and practically instantaneous, giving the engine a very high efficiency.

592,073.—*Gas Engine.*—Paul Auriol, Paris, France. Filed April 17, 1896. Serial No. 587,950. Patented in France, Sept. 19, 1895, No. 250,384.

The motor is composed of a clyinder A, provided with journals *a' b'*, which are perpendicular to its axis and supported by the bearings C C. In this cylinder two pistons P P' move in opposite directions, which pistons are furnished with rollers D and D'. These rollers may be mounted upon balls, as shown in Fig. 1, or upon a smooth axis. The said rollers bear continually against a roller-path E of elliptical form or of an approximate curve. This elliptical form is an integral part of my invention as it enables me to effect in a single revolution the four periods of the cycle of gas-engines—namely, as shown in Fig. 5 and also in Fig. 11. When one roller-path is used, as just described, the periphery of the rollers may be formed in a single plane, as shown at D[9] in Fig. 12. Charging is effected by means of the passages *a b* and *c d*, the pistons having traversed *b g* and *d h*; compression by means of passages *b c* and *d a*, the pistons having traversed *g b* and *h d*; ignition and explosion by means of passages *c d* and *a b*, the pistons having traversed *b g* and *d h*; exhaust by means of passages *d a* and *b c*, the pistons having traversed *g b* and *d h*.

The curve *a b c d a*, which I have just described, would be very well adapted to motors for fluids under pressure, such as steam-engines, compressed-air engines, hydraulic engines and the like; but for gas-motors, it would not permit of any greater expansion of the ignited gases than is usually obtained in other motors. Therefore I have added to the curve *a b c d a* a second curve *a e c f a*, Fig. 6, combined in such a manner with the first curve *a b c d a* that the rollers of the pistons will for the charging bear upon the part *a b* and *c d* of the first curve; for the compression the rollers will bear upon the parts *b c* and *d a* of the first curve; for the ignition the rollers will bear upon the parts *a e* and *c f* of the second curve, and for the exhaust the rollers of the pistons will bear upon *e c* and *f a*. By referring to Fig. 6 it will be seen that the pistons will traverse for the charging *g b* and *d h*, for the compression *b g* and *h d*, for the ignition and expansion *g e* and *f h*, and for the exhaust *g e* and *h f*; and if, for example, I make *g b*=*b e* it will be seen that the charging equals *g b* and the ignition equals 2 *g b*. It is evident that without changing the principle of the invention I may give to the parts *g b* and *b c* the relations which may be desired. In order to effect in practice this combination of the two curves, I have arranged the portion of the first curve *a b c* as a projection upon the portion of the second curve *a e c*, as is well represented on the right-hand side of Figs. 2 and 4, and the portion of the second curve *c f a* is arranged intaglio or recessed into the portion of the second curve *c d a*, as is represented on the left-hand side of Figs. 2 and 4. In order that the rollers D and D' may at the desired moment bear upon one or the other curve, one of the rollers D is provided with a sufficiently wide and sufficiently deep groove for the portion of curve *a b c*, in the passage of the portion of curve *a e c*, to be able to enter the groove of the roller without touching the latter. The other roller D D' is a simple roller, exactly of the width of the path *a b c f a*. It will therefore be seen from this arrangement that the roller D can only roll upon the path *a e c d a*, and that the roller D' can only roll upon the path *a b c f a*.

In order that the pistons may be properly guided up to the end of their stroke, I have made the cylinder nearly equal in length to the major axis of the curve and I have provided at each extremity of the cylinder A a slot for the passage of the part of the curve corresponding to the ends of the minor axis,

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